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PROCEEDINGS

Wood Preservers Association

1911

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PROCEEDINGS

OF THE

Seventh Annual Meeting

OF THE

Wood Preservers' Association

HELD AT THE

Auditorium Hotel, Chicago, Illinois
January 17, 18, 19, 1911

F. J. ANGIER, SECRETARY
CHICAGO, ILLINOIS

PRINTED AT THE SIGN OF THE BAZNER PRESS
CHICAGO, ILLINOIS

JOHN T. LOGAN
President

Wood Preservers in Session — Auditorium Hotel, January 18, 1911

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Constitution and By-Laws

(Adopted Jan'y 17th, 1905.)

ARTICLE I.

Name and Object.

Section 1. The Name of this Association shall be "Wood Preservers' Association."

Sec. 2. The object of the Association shall be to promote social and professional intercourse among its members; to advance the knowledge and practice of the science of wood preserving, and in all respects maintain a high standard of professional procedure in the work.

Sec. 3. The means to be employed for this purpose shall be: Meetings for the presentation and discussion of appropriate papers and for social and professional intercourse; the publication of such papers and discussions as may be deemed expedient, and in such other ways as the members may from time to time consider advisable.

ARTICLE II.

Membership.

Section 1. The Association shall consist of corporate and associate members.

Sec. 2. A corporate member shall either be an executive or administrative officer of some operating wood preserving plant.

Sec. 3. An associate member shall be a person who has such a knowledge of or connection with applied science as qualifies him, in the opinion of the Executive Committee, to co-operate with the corporate members in the advancement of the art of wood preservation.

Sec. 4. Associate members shall not be entitled to vote or hold office, but shall enjoy all the other privileges of the Association.

ARTICLE III.

Admissions.

Section 1. Application for admission to the Association shall be in the form prescribed by the Executive Committee, endorsed by one corporate member of the Association, and forwarded to the Secretary for transmission to the Chairman of the Executive Committee.

Sec. 2. The Executive Committee, by a majority vote, shall pass upon said application by letter or by personal ballot, and if said applicant is duly elected a member, instruct the Secretary to so inform him by forwarding to him a certificate of membership bearing the date of his election, and to enter his name upon the rolls of the Association.

Sec. 3. In the case of favorable action, upon the applicant forwarding to the Secretary the proper amount of dues for the current year, the Secretary shall forward to such member-elect a certificate of membership bearing the date of his election by the Executive Committee. Should such applicant fail to pay the membership fee for a period of thirty days after the date of notification by the Secretary of his election, the same shall lapse, unless, in the opinion of the Executive Committee, the circumstances warrant an extension of time for an additional period of thirty days.

ARTICLE IV.

Dues.

Section 1. The dues on admission to the Association and yearly thereafter shall be:

For corporate member, ten dollars ($10.00).

For associate member, ten dollars ($10.00).

The annual dues shall be payable for the ensuing year in advance on the first day of January. The Secretary shall notify each member of the amount due for the ensuing year at the time the same becomes due.

Sec. 2. A person elected after the first day of April in any year shall pay only one-half the annual dues for that fiscal year.

Sec. 3. Any person whose dues are more than three months in arrears shall be notified by the Secretary, and until the same are paid his privilege of membership shall be in abeyance. Should his dues become one year in arrears, his membership in the Association shall be cancelled.

ARTICLE V.

Officers.

Section 1. The officers of the Association shall be a President, three Vice-Presidents and a Secretary-Treasurer, who shall constitute an Executive Committee, in which the government of the Association shall be vested, and who shall have power to pass upon the eligibility of proposed members, and arrange programs for future meetings, select all subjects for discussion, appoint all committees necessary and have full power in all matters not otherwise provided for.

Sec. 2. The term of office for all officers shall be one (1) year.

Sec. 3. A vacancy in the office of President shall be filled by the Vice-Presidents in their proper order.

Sec. 4. All officers shall be elected by ballot.

ARTICLE VI.

Management.

Section 1. The President, under the direction of and as Chairman of the Executive Committee, shall exercise a general supervision over the affairs of the Association. He shall preside at all business meetings of the Association at which he may be present, and call special meetings when the same may be necessary.

Sec. 2. The Vice-Presidents in their proper order shall preside at business meetings, in the absence of the President.

Sec. 3. The Executive Committee shall manage the affairs of the Association in conformity with the provisions of this Constitution. They shall direct the investment and care of the funds of the Association; make appropriations for specific purposes; act upon applications for membership, as heretofore provided; constitute the Auditing Board, and generally conduct the business of the Association. They shall make an annual report at the annual meeting, transmitting the report of the Treasurer and of other officers and committees.

Sec. 4. The Secretary-Treasurer, under the direction of the President and Executive Committee, shall be the executive officer of the Association, having charge of the books of the Association, and keeping a record of all meetings, and of other matters, as directed by the President of the Executive Committee. It shall also be his duty to advise the members of all meetings, taking charge of and preserving all papers read and discussed, and, when necessary, preparing copies or abstracts of the same for publication. He shall see that all moneys due the Association are collected, and be the custodian therefor. He shall verify the correctness of all bills presented for payment, and pay the same when duly approved and countersigned by the President. He shall also make an annual report, to be audited and presented to the Association by the Executive Committee.

ARTICLE VII.

Meetings.

Section 1. An annual meeting, at which the officers for the ensuing year shall be elected and all annual reports read, shall be held on the third (3) Tuesday of January in each year at ten (10) o'clock A. M., at such place as the Association, at the previous annual meeting, may designate.

Sec. 2. Whenever the President shall deem it necessary, or upon the written application of fifteen (15) corporate members, stating the necessity of holding a special meeting, he shall direct the Secretary-Treasurer to call such a meeting. The notice thereof shall state the time and place of holding the meeting and the purpose for which it is called, and shall be mailed not less than thirty (30) days previous to the date of the proposed meeting.

Sec. 3. At all regular meetings of the Association a majority of the corporate members present shall constitute a quorum, but no quorum shall consist of less than ten (10) corporate members.

Sec. 4. The Association may adopt, from time to time, rules for the order of business at its meetings.

ARTICLE VIII.

Amendments.

Section 1. Proposed amendments to this Constitution must be reduced to writing and signed by at least five (5) corporate members, and forwarded to the Secretary not less than thirty (30) days prior to the annual meeting. Advice of such proposed amendment must then be sent by the Secretary-Treasurer to the corporate members, stating that the question will be acted upon at the next annual meeting.

Sec. 2. The proposed amendment may be adopted at the annual meeting by a majority vote, but when final action is taken a two-thirds (2/3) majority of those present and voting shall be necessary for its adoption.

NOT FOR PECUNIARY PROFIT.

DRAFT OF ARTICLES OF INCORPORATION OF THE WOOD PRESERVERS' ASSOCIATION.

State of Illinois, } ss.
County of Cook, }

We, the undersigned, J. B. Card of the City of Highland Park, and State of Illinois, C. D. Chanute of the City of Chicago, and State of Illinois, and F. J. Angier of the Village of Riverside, and State of Illinois, all citizens of the United States, propose to form a corporation under an act of the General Assembly of the State of Illinois, entitled "An Act Concerning Corporations," approved April 18, 1872, and all acts amendatory thereof and supplementary thereto; and for the purpose of such organization we hereby unite in and execute and adopt the following Articles of Incorporation, to-wit:

1. The name of this corporation is the "Wood Preservers' Association."

2. The objects and purposes for which this corporation is formed are: To advance the wood preserving industry in all its branches; to afford its members opportunities for the interchange of ideas with respect to improvements in the wood preserving industry, and for the discussion of all matters bearing upon the industry of wood preserving; to maintain a high business and professional standard in all respects; and to standardize specifications for wood preservatives and their introduction into the material to be preserved.

The means employed to obtain these objects and purposes shall be: Meetings for the presentation and discussion of appropriate papers and for social and professional intercourse; the publication of such papers and discussions as may be deemed expedient; co-operation with other Societies, Associations and Organizations in the work of standardizing these specifications affecting the wood preserving industry; and all other things incidental or conducive to the attainment of the objects of the Association or any of them, as the members may from time to time consider advisable.

3. The management of the business and prudential affairs of this corporation shall be vested in an executive board of five members, to be elected as hereafter to be provided in the by-laws.

4. The names of the members of the Executive Board or directors who are hereby selected to control and manage the business and prudential affairs of said corporation for the first year are as follows:

NAME.	RESIDENCE.
John T. Logan,	Texarkana, Texas.
R. J. Calder,	Galveston, Texas.
Andrew Gibson,	Paradise, Mont.
D. Burkhalter,	Bradford, Pa.
F. J. Angier,	Chicago, Ill.

5. The location of this corporation is in the City of Chicago, County of Cook, State of Illinois, and the postoffice address and business office is at 1033 First National Bank Bldg., in the said City of Chicago.

In witness whereof, we have hereunto set our hands and seals, this 24th day of February, 1911.

J. B. CARD,
C. D. CHANUTE,
F. J. ANGIER.

State of Illinois, } ss.
County of Cook, }

I, the undersigned, Notary Public in and for said County and State, do hereby certify that J. B. Card, C. D. Chanute and F. J. Angier, personally known to me to be the persons whose names are subscribed to the annexed and foregoing instrument of writing, appeared before me this day in person, and severally acknowledged the signing of same to be their free and voluntary act and deed for the uses and purposes therein set forth.

HARRIET HEISLER,
Notary Public.

State of Illinois

Department of State.

James A. Rose, Secretary of State.

To all to whom these presents shall come, Greeting:

WHEREAS, a certificate, duly signed and acknowledged, has been filed in the Office of the Secretary of State on the 7th day of March, A. D., 1911, for the organization of the

Wood Preservers' Association,

under and in accordance with provisions of "An Act Concerning Corporations," approved April 18, 1872, and in force July 1, 1872, and all acts amendatory thereof, a copy of which certificate is hereto attached;

NOW THEREFORE, I, James A. Rose, Secretary of State of the State of Illinois, by virtue of the powers and duties vested in me by law, do hereby certify that the said

Wood Preservers' Association,

is a legally organized Corporation under the laws of this State.

TESTIMONY WHEREOF, I hereto set my hand and cause to be affixed the great Seal of State.

SEAL.

Done at the City of Springfield, this 7th day of March, A. D., 1911, and of the Independence of the United States the one hundred and thirty-fifth.

(Signed) JAMES A. ROSE,
Secretary of State.

Officers for 1910.

Walter Buehler	President
C. W. Berry	First Vice-President
David Allerton	Second Vice-President
C. D. Chanute	Third Vice-President
F. J. Angier	Secretary-Treasurer

Executive Committee, 1910.

Walter Buehler, C. W, Berry, David Allerton, C. D. Chanute, F. J. Angier.

Program Committee, 1910.

H. M. Rollins, Chairman.

Amos Smith, Andrew Gibson, R. L. Allardyce,
Hermann von Schrenk, C. Marshall Taylor, Wm. Townsley, Jr.

Committee on Revision of Constitution and By-Laws.

J. S. Baker, Chairman.

R. J. Calder, J. B. Card, R. S. Manley, J. C. Williams.

Officers for 1911.

John T. Logan	President
Andrew Gibson	First Vice-President
R. J. Calder	Second Vice-President
D. Burkhalter	Third Vice-President
F. J. Angier	Secretary-Treasurer

Executive Committee, 1911.

John T. Logan, Andrew Gibson, R. J. Calder, D. Burkhalter, F. J. Angier.

Program Committee, 1911.

A. E. Larkin, Chairman.

W. F. Goltra, J. H. Waterman, E. A. Sterling,
Geo. E. Rex, Howard F. Weiss, W. W. Curtis.

Advertising Committee, 1911.

F. J. Angier, Chairman.

C. D. Chanute, John T. Logan. Wm. Townsley, Jr.,
Grant B. Shipley, Walter Buehler, R. J. Calder,

The Association is not responsible, as a body, for the opinions or views expressed by individual members.

LIST OF MEMBERS OF THE WOOD PRESERVERS' ASSOCIATION.

Corporate Members.

Allardyce, R. L., Superintendent I. C. & C. Co., Texarkana, Texas.

Allerton, David, care The Kettle River Co., Madison, Ill.

Angier, F. J., Consulting Timber Treating Engineer, C. B. & Q. R. R. Co., Chicago, Ill.

Armstrong, R. L., Secretary and Treasurer Southern Creosoting Co., Slidell, La.

Berry, C. W., Superintendent Wood Preserving Works, Union Pacific Ry., Laramie, Wyo.

Boehne, E. E., Office Manager I. C. & C. Co., Beaumont, Texas. (1911.)

Buehler, Walter, Manager of Plants, The Kettle River Co., Minneapolis, Minn.

Burkhalter, D., Superintendent Creosoting Plant, B. R. & P. Ry. Co., Bradford, Pa.

Calder, R. J., Secretary and Treasurer I. C. & C. Co., Galveston, Texas.

J. B. Card, President Indiana Zinc-Creosoting Co., Chicago, Ill.

Chanute, C. D., Manager O. Chanute Co., Chicago, Ill.

Christian, Edmund, General Manager Norfolk Creosoting Co., Norfolk, Va.

Coleman, Geo. A., care Coleman Creosoting Works, Seattle, Wash.

Cotter, Geo. F., Vice-President National Lumber & Creosoting Co., Texarkana, Ark.

Curtis, W. W., Consulting Engineer, Chicago. (1911.)

Davidson, G. M., Engineer of Tests C. & N. W. Ry., Chicago, Ill.

Eldridge, W. W., care C. B. & Q. R. R. Co., Aurora, Ill. (1911.)

Eppinger, Jesse I., General Manager Eppinger & Russell Co., New York. (1911.)

Faulkner, E. O., Manager Tie & Timber Dept. A. T. & S. Fe. Ry. Co., Los Angeles, Cal.

Fulks, E. B., care American Creosoting Co., Chicago, Ill.

Foley, John, Asst. Manager of Plants and Asst. Forester Penn. Lines, Philadelphia, Pa. (1911.)

Gerhard, H. H., Manager C. A. Wood Preserver Co., St. Louis, Mo.

Gibson, Andrew, Superintendent T. & T. T. Plants, N. P. Ry., Paradise, Mont.

Graham, Floyd N., care Chicago & Great Western Ry., Chicago. (1911.)

Hageboeck, A. E., U. S. Inspector, Davenport, Iowa. ,

Hartmann, E. F., President Carbolinium Wood Preserving Co., New York. (1911.)

Hess, Lawrence E., Superintendent Republic Creosoting Co., Indianapolis, Ind. (1911.)

Kellogg, C. R., Superintendent The Kettle River Co., Madison, Ill.

Labrot, S. W., President American Creosote Works, New Orleans, Louisana.

Larkin, A. E., General Superintendent Republic Creosoting Co., Minneapolis, Minn.

Logan, John T., President National Lumber & Creosoting Co., Texarkana, Ark.

Loud, H. S., care U. S. Wood Preserving Co., New York.

Manley, R. S., Manager Gulfport Creosoting Co., Gulfport, Miss.

McArdle, Frank, Superintendent Indiana Zinc-Creosote Co., Terre Haute, Ind.

Meyer, August, Supervisor Timber Preservation, C. B. & Q. R. R. Co., Galesburg, Ill.

McNeal, George, care The Kettle River Co., Sandstone, Minn.

Nelson, J. M., Superintendent P. & R. Coal & Iron Co., Pottsville, Pa.

Newton, H. M., Treating Engineer and Chemist The Kettle River Co., Madison, Ill.

Parminter, L. J., care International Creosoting & Construction Co., Galveston, Texas.

Rex, George E., Manager Treating Plants A. T. & S. Fe R. R. Co., Topeka, Kan.

Rollins, H. M., Superintendent Gulfport Co., Gulfport, Miss.

Ryan, W. J., Superintendent National Lumber & Creosoting Co., Texarkana, Ark. (1911.)

Schilling, Frank, Superintendent Eppinger & Russell Co., Long Island City, N. Y.

Shipley, Grant B., President Pittsburg Wood Preserving Co., Pittsburg, Pa.

Smith, A. M., Superintendent Ayer & Lord Tie Co., Argenta, Ark.

Smith, Phillip R., Secretary Ayer & Lord Tie Co., Chicago.

Smith, P. A., care Norfolk Creosoting Co., Norfolk, Va.

Sterling, E. A., Forester and Manager Treating Plants Penn. R. R. Co., Philadelphia, Pa.

Taylor, C. Marshall, Superintendent Port Reading Creosote Plant, Port Reading, N. J.

Valentine, H. S., Superintendent Eppinger & Russel Co., Jacksonville, Fla.

Von Schrenk, Hermann, Superintendent Timber Preservation Rock Island-Frisco Rys., St. Louis, Mo.

Wales, W. H., Jr., General Manager Atlantic Creosoting Co., Norfolk, Va.

Waterman, J. H., Superintendent Timber Preservation C. B. & Q R. R. Co., Galesburg, Ill. (1911.)

Wheaton, Walter R., Timber Engineer San Joaquin Light & Power Co., Fresno, Cal.

Whitmore, H. J., Superintendent M. K. & T. Plant, Dennison Texas.

Williams, J. C., Superintendent The Barber Asphalt Paving Co., Maurer, N. J.

Yarbrough, R. W., Texarkana, Ark.

Associate Members.

Bestor, Frank C., The Kettle River Co., Minneapolis, Minn. (1911.)

Cherrington, F. W., Manager Timber Preservation Indian Refining Co., Cincinnati, Ohio.

Church, Sumner R., Chemist Barrett Mfg. Co., Chicago.

Cushing, E. B., Engineer of Construction Harriman Lines, Houston, Texas.

Dixon, J. H., Treating Inspector N. Y. Central Lines, Shirley, Ind.

Fisher, Wm. A., General Agent, Atlantic Coast Line R. R. Co., Wilmington, N. C.

Goltra, W. F., President The W. F. Goltra Tie Co., Cleveland, Ohio.

Greene, C. W., Inspector L. S. & M. S. Ry., Toledo, Ohio.

Grow, J. H., Sales Agent, Allis-Chalmers Co., Milwaukee, Wis. (1911.)

Hawkes, A. W., Western Sales Agent, General Chemical Co., Chicago.

Joyce, A. R., care Joyce-Watkins Co., Chicago.

Kuckuck, Berthold, Technical Director of Messrs. Hulsberg & Co., Charlottenburg, Germany.

Lembcke, G. A., with C. Lembcke & Co., 78 Wall St., New York.

Lounsbury, Jas. A., V. P. Greenlee Bros. & Co., Chicago. (1911.)

Mills, W. C., Salesman Graselli Chemical Co., Cleveland, Ohio. (1911.)

Mitchell, L. E., V. P. & General Manager Mitchell-Crittenden Tie Co., Texarkana, Texas.

Okes, Day I., Chief Engineer The Kettle River Co., Minneapolis, Minnesota.

Townsley, Wm., Jr., care The Greaseel Chemical Co., Cleveland, Ohio.

Van Metre, Ricker, care Joyce-Watkins Co., Chicago, Ill.

Weiss, Howard, F. Assistant Director Forest Products Laboratory, Madison, Wis. (1911.)

Workman, Franz, Engineer, Newtonbreda, Belfast, Ireland. (1911.)

Honorary Member.

Baker, J. S. (Past President), Superintendent Plant El Paso & S. Western Ry., Alamogordo, N. M.

LIST OF ATTENDANCE AT SEVENTH ANNUAL MEETING OF WOOD PRESERVERS' ASSOCIATION.

Members.

Allerton, David, The Kettle River Co., Madison, Ill.

Angier, F. J., Consulting Timber Treating Engineer C. B. & Q. R. R. Co., Chicago.

Boehne, E. E., International Creosoting & Construction Co., Beaumont, Texas.

Buehler, Walter, Manager of Plants, The Kettle River Co., Minneapolis, Minn.

Burkhalter, D., Superintendent Creosoting Plant, B. R. & P. Ry., Bradford, Pa.

Baker, J. S., El Paso & Southwestern Ry., Alamagordo, N. M.

Berry, C. W., Superintendent Wood Preserving Works, Union Pacific Ry., Laramie, Wyo.

Chanute, C. D., Manager O. Chanute & Co., Chicago, Ill.

Card, J. B., President Indiana Zinc-Creosoting Co., Chicago.

Cotter, Geo. F., Vice-President National Lumber & Creosoting Co., Texarkana, Texas.

Church, S. R., Chemist Barrett Mfg. Co., New York.

Cherrington, F. W., Indian Refining Co., Cincinnati, Ohio.

Curtis, W. W., Consulting Engineer, Chicago.

Davidson, G. M., Chemist and Engineer Tests, C. & N. W. Ry., Chicago.

Dixon, J. H., Treating Inspector C. C. C. & St. L. Ry., Shirley, Ind.

Eldridge, W. W., Piece Work Inspector C. B. & Q. R. R. Co., Aurora, Ill.

Fulks, E. B., American Creosoting Co., Chicago.

Fisher, Wm. A., General Agent Atlantic Coast Line Ry., Wilmington, N. C.

Foley, John, First Asst. Forester Penn. R. R. Co., Philadelphia, Pa.

Gibson, Andrew, Superintendent T. P. & T. T. Plants, N. P. Ry., Paradise, Mont.

Gerhard, Harry H., Manager C.-A.-Wood Preserving Co., St. Louis, Mo.

Goltra, W. F., President and General Manager W. F. Goltra Tie Co., Cleveland, Ohio.

Graham, F. N., Timber Treating Inspector C. G. W. Ry., Chicago.

Grow, J. H., Salesman Allis-Chalmers Co., Milwaukee, Wis.

Hageboeck, A. E., U. S. Inspector, Rock Island, Ill.

Hess, L. E., Superintendent Republic Creosoting Co., Indianapolis, Ind.

Joyce, A. R., with Joyce-Watkins Co., Chicago.

Kellogg, C. R., Superintendent The Kettle River Co., Madison, Ill.

Larkin, A. E., Superintendent Republic Creosoting Co., Minneapolis, Minn.

Lembcke, G. A., C. Lembcke & Co., New York.

Logan, Jno. T., President National Lumber & Creosoting Co., Texarkana, Texas.

Lounsbury, James A., Vice-President Greenlee Bros. & Co., Chicago.

Meyer, August, Supervisor C. B. & Q. Tie Plant, Galesburg, Ill.

Mills, Wm. C., The Graselli Chemical Co., Cleveland, Ohio.

McArdle, Frank, Manager Indiana Zinc-Creosoting Co., Terre Haute, Ind.

Newton, H. M., Chief Chemist The Kettle River Co., Madison, Ill.

Okes, Day I., Chief Engineer The Kettle River Co., Minneapolis, Minnesota.

Parminter, L. J., Western Sales Agent International Creosoting & Constructing Co., Galveston, Texas.

Rollins, H. M., Superintendent Gulfport Creosoting Co., Gulfport, Mississippi.

Rex, Geo. E., Manager Treating Plants, A. T. & S. Fe R. R., Topeka, Kan.

Smith, Philip R., Secretary and Treasurer Ayer & Lord Tie Co., Chicago.

Schilling, Frank, Superintendent Eppinger & Russell Co., Long Island City, N. Y.

Shipley, Grant B., President Pittsburg Wood Preserving Co., Pittsburg, Pa.

Sterling, E. A., Forester Penn. R. R. Co., Philadelphia, Pa.

Taylor, C. Marshall, Superintendent Port Reading Creosoting Plant, Phila. & Reading and Jersey Central R. R., Port Reading, New Jersey.

Townsley, Wm., Jr., The Graselli Chemical Co., Cleveland, Ohio.

Van Metre, Ricker, Joyce-Watkins Co., Chicago.

Waterman, J. H., Superintendent Timber Preservation C. B. & Q. R. R. Co., Galesburg, Ill.

Weiss, Howard F., Assistant Director Forest Products Laboratory, Madison, Wis.

Workman, Franz, Engineer, Newtonbreda, Belfast.

Non-Members.

Adkins, James, Jr., Contracting Engineer The Kettle River Co., St. Louis.

Butler, W. W., Chemical Broker, Chicago.

Bruning, H., Schopwurth, Germany.

Barnard, F. M., Eastern Sales Manager The Kettle River Co., Chicago.

Bowser, E. H., Chief Timber Inspector Illinois Central R. R. Co., Memphis, Tenn.

Bond, Jay T., Consulting Forester, Chicago.

Curtis, L. G., Engineer M. of W., B. & O. R. R. Co., Chicago.

Craig, Geo. W., City Engineer, Omaha, Neb.

Campbell, Roy, Chemist with Street Department Citv of St. Louis, St. Louis, Mo.

Cress, John D., American Lumberman, Chicago.

Cook, E. C., Managing Editor Railway Journal, Chicago.

Davis, Harry G., Chicago Street Improvement Association, Chicago.

Derby, W. A., Acting Engineer of Tests C. B. & Q. R. R. Co., Aurora, Ill.

Drinker, W. W., Assistant Engineer Erie Railroad Co., New York.

Dean, Wm. H., Division Engineer B. L. I. City of Chicago, Chicago.

De Berard, W. W., Western Editor Engineering Record, Chicago.

Ericson, L. T., Treating Inspector C. & E. I. and C. R. I. & P., Marion, Ill.

Finke, W. F. H., Tie and Timber Agent Southern Ry., Washington, D. C.

Hale, W. H., Assistant Engineer The Kettle River Co., Minneapolis, Minn.

Hammond, A. J., Consulting Engineer, Chicago.

Hempelmann, W. L., Chemist Street Department City of St. Louis, St. Louis.

Harvey, Wm. F., Assistant Engineer Board of Local Improvements, Chicago.

Jones, Selden, Salesman Allis-Chalmers Co., Atlanta, Ga.

Johnson, E. W., Assistant Engineer Board of Local Improvements, Chicago.

Kenny, J. A., Sales Agent C. A. Wood Preserver Co., Chicago.

Keily, W. E., Associate Editor Electrical World, Chicago.

Lyon, C. A., Graselli Chemical Co., St. Paul, Minn.

Lichty, C. A., Inspector C. & N. W. Ry., Chicago.

Long, J. M., Chicago.

Miller, H. E., Sales Manager Fitz Hugh Luther Co., Chicago.

McGuire, Cloyd C., Milwaukee, Wis.

Page, Geo. S., United Zinc & Chemical Co., Kansas City, Mo.

Pooler, F. S., Tie Agent C. M. & St. P. Ry., Chicago.

Stocking, E. J., Traffic Manager The Kettle River Co., St. Louis, Missouri.

Stimson, Earl, Chief Engineer M. of W. B. & O. Ry., Baltimore, Maryland.

Smith, Lincoln B., Lawyer, Chicago.

Sweeney, Geo. F., Chief Lumber Inspector C. & N. W. R.. Chicago.

Sackett, H. S., U. S. Forest Service, Chicago.

Townsend, T. G., Tie and Timber Inspector Southern Ry., Washington, D. C.

Tiffany, C. W., Assistant in Wood Preservation P. R. R. Co., Philadelphia, Pa.

Vander Starr, M., Manager Chicago Tie & Timber Preserving Co., Waukegan, Ill.

Warmoth, Geo. W., Promoter Republic Creosoting Co., Indianapolis, Ind.

Watkins, W. T., President Joyce-Watkins Co., Chicago.

INDEX TO SESSIONS

Opening 23
Tuesday Afternoon 33
Wednesday Morning 72
Wednesday Afternoon 107
Thursday Morning 163
Thursday Afternoon 185

Opening Session

The Seventh Annual Meeting of the Wood Preservers' Association, held in the South Parlor of the Auditorium Hotel, Chicago, Ill., January 17, 18 and 19, 1911, was called to order by the President of the Association, Mr. Walter Buehler, at ten thirty o'clock A. M., January 17, 1911.

THE PRESIDENT: The Secretary will read the minutes of the last meeting.

The Secretary, Mr. F. J. Angier, then read the minutes of the last meeting.

MR. CHANUTE: I move that the minutes be adopted as read.

Motion duly seconded and carried.

MR. ALLERTON: Mr. Chairman, I wish to make a motion that the Chair appoint a committee to draft resolutions in memoriam of the death of our two members, Mr. Octave Chanute and Mr. S. M. Rowe.

THE PRESIDENT: Motion carried. The Chair appoints as the committee, Mr. Allerton, chairman, Mr. Burkhalter and Mr. Card, to report at the meeting this afternoon at two o'clock.

THE PRESIDENT: We will now have the report of the Secretary-Treasurer.

Secretary Angier then read the report, as follows:

ANNUAL REPORT OF THE SECRETARY-TREASURER.

To the Officers and Members of the Wood Preservers' Association.

Gentlemen: The undersigned begs leave to submit herewith his annual report for the year 1910:

Balance on hand, December 31, 1909		$ 138.95

Receipts.

From advertising	$435.00	
From dues for year 1909	10.00	
From dues for year 1910	550.00	
From sale of proceedings	197.40	
From interest on funds in bank	3.75	1,196.15
		$1,335.10

Disbursements.

Printing 1910 proceedings	$588.73	
Postage and express	71.32	
Stationery, printing blanks, etc	38.45	
Stenographer and clerical help	61.60	
Exchange on funds in bank	.40	
Expenses, Chairman Program Committee	12.00	
Advance copies of papers. 1911 meeting.	105.00	877.50
Cash on hand, December 31, 1910		$457.60

Membership.

Number of members last annual report	50	
Number of members elected during 1910	29	
		79
Resigned	4	
Dropped for non-payment of dues and lack of address	7	
Deceased	2	
		13
Total number in good standing December 31, 1910		66

Respectfully submitted,
F. J. ANGIER,
Secretary-Treasurer.

THE PRESIDENT: The Chair suggests that this report be laid on the table until the Executive Committee have the pleasure—note I say pleasure—of auditing it. The report unquestionably shows very creditable work on the part of the Secretary-Treasurer for the last year.

MR. CARD: I move the report be adopted as read.

Motion duly seconded and carried.

THE PRESIDENT: The Program Committee is to report at two o'clock. We have a number of papers, and the arrangement of the program will have to depend somewhat upon the presence of those who are to give these papers. Some of them will not get here until tomorrow; so that the Program Committee will have to arrange the program before they can make their report.

Are there any reports of special committees appointed during the year?

THE SECRETARY: Two special committees were appointed during the year; one to attend the opening of the Forest Products Laboratory, at Madison, Wis., and the other to attend the Second National Conservation Congress, at St. Paul, Minn. I will read the reports of these committees:

FOREST PRODUCTS LABORATORY, MADISON, WIS.

The opening of the Forest Products Laboratory, at Madison, Wis., occurred June 4, 1910. A very cordial invitation was extended to the members of this Association. The President appointed a committee of five, but unfortunately, all of the committee were not able to be present on the opening day; however, at a later date a visit was made and we were very nicely entertained. Opportunity was given to inspect the laboratory, and the various test machines and apparatus were carefully explained to us by the very courteous attendants. To attempt to describe the apparatus would require too long a time, but we are sure you will be glad to know that a very complete account of this laboratory has been written by Mr. McGarvey Cline, Director of the Laboratory. This paper describes in detail what the Forest Products is, and the character of work to be carried out. A set of excellent photographs, showing interior and exterior views, accompany the paper We believe this laboratory will be a very important factor in the wood preserving world, and we think that every member of this Association should know of the work being done there. As many of our members are not attending this meeting, and as we think their attention should be called to this matter, we suggest that Mr. Cline's paper, together with the photographs, be printed in the proceedings.

Committee: WALTER BUEHLER,
C. W. BERRY,
DAVID ALLERTON,
C. D. CHANUTE,
F. J. ANGIER.

MR. PRESIDENT: Gentlemen, you have heard the report of this committee. What is your pleasure?

MR. GOLTRA: I move that the recommendation of the committee be adopted, to print Mr. Cline's paper in the proceedings.

MR. CARD: I second the motion.

Motion carried unanimously.

(Mr. Cline's paper can be found on page 198)

NATIONAL CONSERVATION CONGRESS, ST. PAUL, MINN.

The Second National Conservation Congress met at St. Paul, Minn., September 5 to 9, 1910. The President of the Congress requested that a committee be appointed to represent the Wood Preservers' Association, and in accordance our president appointed a committee of five. Not all of the committee was able to be present, but those of us who did attend report a very interesting and instructive visit.

The proceedings of the Congress are to be published in book form, and members of this Association may obtain them by addressing the Secretary, Mr. Thomas R. Shipp, 411 Colorado Building, Washington, D. C., and enclosing one dollar.

Committee: WALTER BUEHLER,
F. J. ANGIER,
PHILLIP R. SMITH,
R. S. MANLEY,
H. S. LOUD.

THE PRESIDENT: You have heard the report of this committee? What is your pleasure?

MR. CARD: I move that the report be adopted.

Motion duly seconded and carried.

THE PRESIDENT: Have any communications been received?

THE SECRETARY: Mr. President, I have three letters, as follows:

Galveston, Texas, Jan. 13, 1911.

Mr. F. J. Angier, Secy, Wood Preservers' Assn.,
Chicago, Ill.

My Dear Mr. Angier:

As you will no doubt see within the next day or two from press reports, we had the misfortune of having our Beaumont plant burn completely up last night. Under the circumstances, of course, I will not be able to be at the meeting. However, Mr. Parminter is now in the North, and I am trying to get in touch with him, and if possible, he will attend. I am indeed very sorry I will not be able to be there, but hope you have a most successful meeting.

My having written on insurance is rather a coincident, but doubtless I will be able to give the Association more pointers on this question, after we have been through the experience of this present fire, than I was in this paper. Please remember me kindly to all the members, and express my regrets at not being present.

Yours truly,
R. J. CALDER, Secy. and Treas.
International Creosoting and Construction Co.

October 18, 1910.

Mr. F. J. Angier,
Secretary, Wood Preservers' Association.

Dear Mr. Angier:

As you doubtless know, the United States Forest Service has maintained an office in this city for over a year. The office is known as the Office of Wood Utilization, and its energies have been devoted mainly along the lines of a statistical character, and in the collection of information on the manufacture and use of wood. In its statistical work this office, among other things, publishes quarterly two records of wholesale lumber prices: one f. o. b. markets, the other f. o. b. mills by States. It has also collected statistics covering the use of preservatives throughout the United States as well as statistics showing the use of wood by the various industries in a number of the important consuming States.

In its investigation of the manufacture and use of wood, it has made a study of this character on hickory, co-operating in this instance with the National Hickory Association. It has also inaugurated tests with pencil manufacturers for the purpose of determining if a number of woods may not be used as substitutes for the Southern junipers for this purpose. In co-operation with the Cigar Box Manufacturers, it is now testing some new woods for use in that industry. In co-operation with shuttle manufacturers, it is now testing the use of substitutes in that industry. In co-operation with the Yellow Pine Manufacturers' Association, it has investigated the waste incident to the manufacture of even lengths only of planing mill products in the yellow pine region. It is now inaugurating a study for the purpose of determining the waste incident to the manufacture of even **widths** only. This study will also include the investigation of mill waste in lumber manufacture generally.

Some of the problems enumerated above have been suggested to this office by associations; others have been taken up on our own initiative. In your own Association you are doubtless meeting up with problems on which you may either desire investigation, or wish to have information concerning it collected and prepared. If you have any such at the present time, or if in the future any occur to you, and you believe that this office could render you assistance in working them out, I should be very glad indeed to have you present them for consideration. It is the aim of this office to co-operate to the fullest possible extent with all associations whose members are directly interested in the use and manufacture of wood, and it will be a pleasure to do so whenever the opportunity offers.

Very sincerely yours,
H. S. SACKETT,
In Charge of Wood Utilization.

Memphis, Tenn., Dec. 12, 1910.

Wood Preservers' Association,
Mr. Walter Buehler, President,
St. Louis, Mo.

Gentlemen:—

At a recent meeting of this committee, it was decided, after January 1, 1911, to enlist as Associated Members all Organizations affiliated with the lumber or wooden box industries.

It was further decided there should be no initiation fee for such enrollment or enlistment, and that this Committee should act as a Standing Committee to represent such affiliated Organizations in matters relating to the Classification of Lumber Grades, and particularly at this time, to investigate and report upon the condition of the low grade lumber market, which has been affected by the falling off in the market for Box Lumber, due to the increased use of Straw and Fiber Board for the purpose of making Shipping Packages.

This cause should have the unqualified support of every Lumber Organization in the United States, whether directly or indirectly affected by such Classification. We, therefore, solicit your Organization as associated members. This requires merely your permision to enroll you as Associated Member.

We beg to request that you bring this matter before your Board of Directors, advising us, as quickly as possible, whether or not it is your good pleasure that we enroll you in this Committee.

Yours very truly,
NATIONAL CLASSIFICATION COMMITTEE
OF THE L. & W. B. I. OF THE U. S.
By Chas. E. Brower, Secretary.

THE PRESIDENT: The letter from Mr. Brower will be brought to the attention of the Executive Committee, and the Executive Committee will report to the Association for their action on Thursday.

Executive Committee reported favorably and instructed the Secretary to so notify Mr. Brower. Correspondence follows:

March 16, 1911.

National Classification Committee of the Lumber and Wooden
Box Interests of the United States, Memphis, Tenn.

Gentlemen:

Your letter of December 12, 1910, addressed to the President of this Association, inviting the Wood Preservers' Association to become an associate member of your organization, was brought up before our last meeting and referred to the Executive Committee for action. This Committee has just made its report, which is favorable, and I therefore take pleasure in so informing your committee, that you may take immediate action in the matter.

Yours truly,

F. J. ANGIER,
Secretary-Treasurer.

To CHAS. E. BROWER,
Secretary.

Memphis, Tenn., March 18, 1911.

Wood Preservers' Association,
Mr. F. J. Angier, Secretary-Treasurer,
Chicago, Ill.

Dear Sir:—

We beg to thank you for your courteous letter of March 16th, advising us that you wished to be enrolled as a Associated Member of this Committee.

We will take pleasure in advising you from time to time of our acts, and will thank you for a list of your individual members, that we may put them on our mailing list. There will be times when we no doubt will require your moral support.

It is our purpose to make this Committee a unit of the entire Lumber Interests of the United States, and we feel sure you will appreciate the great value of such a standing Committee.

Yours very truly,

NATIONAL CLASSIFICATION COMMITTEE
OF THE L. & W. B. I. OF THE U. S.
Chas. E. Brower, Secretary.

THE PRESIDENT: There was a committee appointed on suggested amendments to the constitution. Mr. Baker is chairman of that committee.

MR. BAKER: Mr. President, I would suggest that that report be postponed until Thursday, or until such time as we can take action on it as a business meeting.

THE PRESIDENT: I think that is a good suggestion. We have quite a number of visitors and members due tomorrow. There are a great many papers, and all of them are papers that will bring forth quite a little discussion, so that Thursday will probably be a business meeting. I think Mr. Baker's suggestion to have this report come up Thursday instead of at the present time is a good one; so that the Association may expect this report some time during the business meeting on Thursday.

Is there any new business to come before the Association?

MR. CHANUTE: Mr. President, I move that you appoint an Advertising Committee of six members, the President to be a member ex-officio.

THE PRESIDENT: Is that Committee to be appointed now?

MR. CHANUTE: To be appointed by the Chair during the meeting some time.

Motion seconded.

THE PRESIDENT: It has been moved and seconded that the Chair appoint a committee some time during this convention on advertising, which committee is to take care of the advertising in the publication of the Association for the year 1911. All those in favor will please signfy it by saying, Aye; contrary, No.

Motion carried unanimously.

THE SECRETARY: Mr. President, The Wood Preservers' Association has never been incorporated, and I move you that a committee of three be appointed to consider the incorporation of the Association, and that this committee report on Thursday.

MR. GOLTRA: I second the motion.

Motion carried.

THE PRESIDENT: It has been customary that the Chair at this time appoint an Entertainment Committee. I will appoint Mr. William Townsley, Jr., Chairman, Mr. J. B. Card and Mr. Phillip Smith. This Committee will probably report some time during tomorrow.

If there is no further business, a motion to adjourn will be in order.

SECRETARY ANGIER: Just a word; we have had some attendance cards printed which were given out at the door. You are requested to fill these out, whether a member or not, and hand in to the Secretary, that we may get a correct list of those in attendance.

MR. BAKER: Mr. Chairman, I move you that we adjourn till two o'clock.

An adjournment was then taken.

Program

TUESDAY AFTERNOON.
1:30 P. M.

1. Is the Covering of Retorts Economical and Practical?.... ....By R. W. Yarbrough
2. How Can Excessive Insurance Rates, Usually Charged by Insurance Companies, Be Avoided.........By R. J. Calder
3. Difficulties Encountered by Plants in the North that Plants Located in the South Do Not Have to Contend With ....By Andrew Gibson
4. Should Sawn and Hewn Ties of the Same Kind of Timber of the Same Degree of Seasoning, Be Treated in the Same Cylinder Load?...................By H. J. Whitmore
5. Wood Block Paving............By Dr. Hermann von Schrenk

WEDNESDAY MORNING.
10 A. M.

6. How to Pile Lumber, or Piling Timber...By J. H. Waterman
7. Feasibility of Grouping Timbers for Treatment........ ....By W. F. Goltra

WEDNESDAY AFTERNOON.
2 P. M.

8. What Depths of Penetration are to be Expected from the Different Amounts of Preservatives Usually Specified?.. ....By David Allerton

9. What Depths of Penetration are to be Expected from the Different Amounts of Preservatives Usually Specified?.. ....By R. L. Allardyce

10. Some Results Obtained In This Country In Prolonging the Life of Railway Cross-Ties By Preservative Treatment as Shown by the Records that Have Been Kept; and a Better Method of Keeping These Records....... ....By F. J. Angier

11. Some Results from Treated Ties Along the South Atlantic Coast ....By Wm. A. Fisher

12. Timber Supply in Relation to Wood Preservation...... ....By E. A. Sterling

13. General Review of Timber Treating In This Country, with Special Reference to Causes that Have Been and Are Retarding Its More Universal Adoption..By John T. Logan

14. Review of Development In Timber Treating Industry.. ....By Walter Buehler

15. Benefits Derived from Attending the Annual Meetings of the Wood Preservers' Association by Members of the Association ....By Wm. Townsley, Jr.

THURSDAY MORNING.

10 A. M.

16. What Percentage of Creosote Oil Can Be Withdrawn from Wood by Subsequent Vacuum?......By C. D. Chanute

17. Asphaltic Oils as Applied to the Preservation of Railroad Ties............................By Frank W. Cherrington

18. Impurities in Zinc-Chloride...........By C. Marshall Taylor

THURSDAY AFTERNOON.

2 P. M.

Unfinished Business.

Election of Officers.

Place of Next Meeting.

Adjournment.

TUESDAY AFTERNOON SESSION,
January 17, 1911.

The meeting was called to order by the First Vice-President, Mr. David Allerton, at two o'clock, p. m.

CHAIRMAN ALLERTON: The first number on the program this afternoon is a paper by Mr. R. W. Yarbrough, Superintendent of the National Lumber and Creosoting Company, Texarkana, on the subject, "Is the Covering of Retorts Economical and Practical?"

In the absence of Mr. Yarbrough his paper was read by Secretary Angier, as follows:

IS THE COVERING OF RETORTS ECONOMICAL AND PRACTICAL?

In the treatment of this subject of whether it pays and is practical to cover retorts, I find that in the first part of the subject I simply have to assume certain conditions under which the retort is operating and make my deductions from that.

I have taken a 7 ft. retort, 132 ft. long and operating under 250° of heat, eight hours a day. If you are not steaming and carry your oil at 150° my figures will be reduced one-half. I have taken the outside temperature to be 60°.

The cylinder will have 2,972.68 square feet of surface exposed to radiation. The best authorities give 2.23 B. T. U. lost per square foot per hour for every degree of temperature. We have 250° in retort, outside temperature of 60°, leaving a difference in temperature of 190°. Take this 190° times 2,972.68 square feet of surface exposed times 2.23 B. T. U. lost for every degree of heat per square foot and we have 1,237,023.37 lost every hour. This only represents the theoretical loss, as in generating this heat from coal and transmitting it in the form of steam is lost 40 per cent of the calorific power of the coal. Add this 40 per cent to the 1,237,023.37 B. T. U. lost in retort and we have lost 2,061,705 B. T. U. of heat in one hour. The next thing is to see how many pounds of coal this amounts to. A fair average of the heating value of our coal is 11,000 B. T. U. a pound. Divide this into the 2,061,705 B. T. U. lost in retort and the result will be 187 pounds of coal, which has been burned and for which no useful work has been done. This coal, we will say, is costing $3.00 per ton at fire room. I will assume we have lost 13 more pounds before it gets to retort, making a total of 200 pounds of coal lost from radiation. This is one-tenth of a ton at $3.00 per ton, which makes 30c for every hour. This, multiplied by eight hours, means a loss of $2.40 worth of coal in eight hours. If we run 300 days out of a year, we have lost $720.00 for want of retort covering.

Having shown the loss of money by not covering retorts, let us see what it costs to cover same, and whether it pays. I will say that it costs $1,000.00 to cover the retort. That can be cut in two if a cheaper covering is used, which I will recommend before I finish this article. This $1,000.00 cost will represent an interest charge of 31c per day. This taken from the $2.40 saved by covering, leaves a net saving of $2.09 a day. There is another big saving in having restorts covered, and that is, that after you once get them hot, it is very little trouble to keep them that way. That is well recognized by all good operators, and they always strive to change charges as rapidly as possible so as to keep retort hot. You can store up lots of heat units in a well covered retort, but there isn't much doing in a bare one.

Before leaving this subject of saving on retort covering, I would like to give some figures that were obtained from actual experience with different pipe coverings over unprotected pipe. These experiments were carried out by Mr. George M. Brill, M. E. He took 60 ft. of 8-inch pipe and carried from 110 to 119 pounds steam pressure in it. The experiment was carried on in still air; temperature varied from 50° to 80°. To be sure of admitting dry steam to pipe, he admitted it through a separator. The 60 ft. of pipe had one foot of fall to it. At end of pipe he had a large receiver connected, into which water gravitated as fast as it formed. The water was carefully measured during the testing of each covering. These tests were practical in every detail, and I think the figures obtained are reliable. He figured his coal at $2.44 a ton and added 12 per cent for cost of firing, and his evaporation at 7 pounds of water per pound of coal.

These are figures he finds with the different kinds of coverings:

	B. T. U. Transmitted per hour per sq. ft. of pipe per degree difference in temperature.	Lbs. Steam condensed per hour per sq. ft. pipe per degree difference in temperature.	Lbs. Steam saved per 100 sq. ft. pipe per year.	Saving in dollars per 100 sq. ft. pipe per year.
Bare Pipe	2.7059	.003107	......	....
Magnesia	.3838	.000432	635801	$110.82
Rock Wool	.2556	.000285	670666	116.90
Mineral Wool	.2846	.000311	662957	115.55
Fire Felt	.5023	.000591	603389	105.17
Maneville Sectional and Hair Felt ..	.2119	.000243	682930	119.03
Manville Wool Cement	.3448	.000709	646488	112.68
Hair Felt	.4220	.000472	627376	109.00
Fossil Meal	.8787	.001010	500287	87.20

Approximately 10 square feet of unprotected pipe will condense 105 pounds of steam in winter in 10 hours. Under the same conditions in summer 62½ pounds. The same pipe covered will condense 8½ pounds in winter and 6½ pounds in summer. This represents a saving of 184,411 heat units in first case and 116,016 in latter case.

After going into this subject, I am convinced that we can all save a lot of coal if we cover our working tanks and storage tanks, as they have to carry a temperature of 150° all the time. This will apply especially to plants working in the winter in the North.

Now, as to the practicability of it; that depends entirely on the condition of your retorts. If you have some that require a boilermaker every Sunday to keep them tight, the cost of keeping the covering patched will soon eat up the profits.

One of the best cheap coverings that is recommended, is made of sawdust mixed with starch to make it stick together. This can be applied by wrapping the retort with ordinary poultry wire, with ½-inch spacer blocks between the wire and retort. Apply it about 2 inches thick, make smooth and whitewash, or paint with a black paint if desired.

Before finishing this subject I would like to give some practical experiences I had with naked and covered retorts. When I first went with the National Lumber & Creosoting Company they were steaming everything. They had just finished doubling their retort and boiler capacity, and in addition had put in a new air compressor that had a 16x18-inch steam cylinder. We had put a number of hoists on the yard to run with air, and it called for more steam. The new retort was bare and the old one was covered with clay. All the steam pipes were covered with asbestos. One of the first things the engineer and fireman told me was that they were short on boiler power, and when we went to raise the temperature on the retorts it looked that way. I began to look around to see what I could do about it. I got a pipe covering man to figure on covering retorts. His prices were high and what he proposed to furnish was not good. In reading up on the subject of non-conductors, I found that silk stood at the head of the list, and, of course, the cost was too high for a creosote man to consider. From what I could learn the theory of the efficiency of a non-conducting material depends upon the number of minute air cells in the material used. We had a material right at our door that I thought ought to make a good covering, and that was cottonseed hulls. The Company already had a lot of wooden segments and lathing on hand, to use in mudding over the new retort. The President agreed to buy a ton of hulls, and I "went after it." I nailed the segments around the retorts—and lathing to them, leaving a space between the retorts and lathing of about 2½ inches, and packed the hulls in this space. I had put on but a very little before I found that I had stopped radiation, and when I finished, our troubles for want of steam were over. After raising temperature the first time, we could raise it in from twenty to twenty-five minutes. I figured that this saved the company from $5.00 to $6.00 per day on the coal. The engineers were able to shut off the steam from boilers for twenty or thirty minutes at a time without any loss of temperature. Personally, I don't think I shall ever be able to get better results out of any covering than I got out of that.

I would suggest the use of sheet iron on the outside of segments in place of wood lathing.

You can buy hulls for about $10.00 a ton at the mill. About three tons will be ample to cover a retort. Sheet iron will cost something like $80.00 and the labor of putting on $150.00. The total cost should not be over $300.00.

I believe that this will give you as fine a non-conducting material as it is practical to use.

The Germans and Italians are today using a fireless locomotive. I talked with a gentleman from Germany last summer who said they were using one very satisfactorily in one of their creosote plants. The efficiency of this locomotive depends on the amount of heat units that can be stored in water and a non-conducting material to retain the heat in the boiler. They simply fill the boiler nearly full of water, connect it to the plant battery of boilers and turn steam on it, and bring the pressure up to whatever their main battery of boilers are at the time; shut-off, disconnect and are ready for work. Whenever they use a little steam the pressure is lowered and ebulition takes place and more steam is generated at a little lower pressure. This is kept up until the pressure gets too low and the boiler is recharged.

In conclusion I want to say that the subject of saving steam has always been a live one with me, as I used to be in the fireroom and anything that saved a little physical energy on my part always appealed to me.

Thanking you, gentlemen, for your attention while I have been talking on a subject—from which to get the best results, must always be handled "dry," I am,

Yours very truly,

R. W. YARBROUGH, M. E.

CHAIRMAN ALLERTON: Gentlemen, you have all heard the paper and it is now open for discussion, and I hope quite a number of you will have something to say on this subject. A written discussion has been prepared by Mr. J. C. Williams, and our Secretary will kindly read it.

Secretary Angier then read the paper, as follows:

DISCUSSION BY J. C. WILLIAMS.

Personally, I agree with Mr. Yarbrough that it is both practical and economical to cover the cylinders and this, too, regardless of whether they are housed in or not.

At the Norfolk Creosoting Works, in the early part of 1900, they had their cylinders out of doors and covered them with a sort of asbestos or air cell covering which came in rectangular blocks. These were bound fast by ordinary two-inch mesh galvanized wire netting and the whole cemented over and then covered with canvas, which was painted.

In October, 1906, I investigated this subject very thoroughly for The Barber Asphalt Paving Company and found that we could cover each of our cylinders, six by one hundred and fifteen feet, for anywhere from $400, for mineral wool, secured with wood lagging, up to $1,250, for eighty-five per cent magnesia blocks, two and one-half inches thick, with a one-half-inch asbestos plaster, smooth hard finish, three-inch total thickness, and the whole covered with eight-ounce canvas sewed on.

I finally had the work done for $500, using two-inch of eighty-five per cent magesia cement with a skim of hard finish. The cement was applied in layers interspersed with two-inch galvanized wire netting.

We have had good results from this covering and it is still whole and in good condition. The only extra protection we gave it was to lay a permanent gang plank along the whole length of the top of the cylinder to keep the men from walking on the covering.

We saved from one to two hundred dollars by omitting the outside canvas covering, depending on whether it was pasted or sewed on, and we have never regretted that we did not put the canvas on.

The reason we did not use the mineral wool, which we could have applied the same as Mr. Yarbrough did his cotton-seed hulls, was because we thought the wool would settle away from the top of the cylinder, where it was most needed, and it would be some annoyance and expense to fill the vacancy from time to time. I imagine that this might also be the case with the hulls.

One of the advantages of covering the cylinders additional to those mentioned by Mr. Yarbrough, is that it aids materially in maintaining the heat while the vacuum pump is running, so that live steam can be used in the coils and the supply regulated by an automatic trap, instead of blowing superheated steam through them, thus saving not only in the expense of operating the superheater, but in the quantity of steam used in the coils, as well.

MR. CARD: I believe the C. B. & Q. Ry. use a rather inexpensive covering, and possibly Mr. Angier might give us some information on that. They put their own covering on the retorts and I understand it cost but very little. We would be glad to hear from Mr. Angier.

SECRETARY ANGIER: Mr. President, the retorts at the Galesburg plant are covered with lagging composed of equal parts of lime, saw-dust and asbestos. It is placed on the retorts about two inches thick, and No. 14 iron wire wrapped around at different times while the lagging is put on, to hold it in place. No heating coils are used in the retorts, and the loss of temperature of the creosote or mixed solution from the time it is first introduced into the retorts, until it is forced back, averages about thirty-six degrees the year around. I have here a table showing the loss in temperature for each month during the year. In getting out this table about ten representative runs were taken from each month, and it shows that in January the loss was forty-one degrees; that is, from the time the solution left the treating tank, until it was forced back after the treating of the timber; in February, there was a loss of thirty-eight degrees; March, thirty-four degrees; April, thirty-five degrees; May, forty-five degrees; June, thirty-nine degrees; July, thirty degrees; August, thirty-one degrees; September, thirty-one degrees; October, thirty-six degrees; November, thirty-five degrees; and December, forty degrees—the average being thirty-six degrees. In nearly every case treatment was made with the mixture process, and the pressure was held for from five to six hours, except where the ties were not sufficiently seasoned, and then the steaming was usually from one to two hours at five pounds pressure.

CHAIRMEN ALLERTON: We would like to hear from some one else. There must be quite a number of different methods of insulating retorts where they are insulated. Mr. Berry, you might describe the practice on the Harriman system.

MR. BERRY: I have nothing to say, Mr. President, on the subject.

SECRETARY ANGIER: Mr. President, we have with us today Mr. Larkin, of the Republic Creosoting Company, and I believe that at their Minneapolis plant they have one of their tanks insulated or covered with some kind of material. It would be interesting to know what that is.

MR. LARKIN: We have a twenty by twenty-foot tank used for treating exclusively and during cold weather before an insulation was built around it, it was almost impossible, situated as that tank is out in the open where it is subjected to all the severe cold winds and weather of that locality, to keep the contents hot enough for work.

The insulation consits of 2x6's standing on end with 2-inch edge against the tank and fastened at top and bottom of tank and spaced thirty inches apart all around the circumference, then quarter by four-inch boards were bent around and firmly nailed to the outer edge of the uprights, the thin strips being placed as close together as possible all the way up the side of the tank.

This construction left practically a six-inch air space all around the tank, which we filled with sawdust after the jacket was complete, a roof was then put on in the same way except that no sawdust was used and a final covering of tarfelt was added.

My observation has shown that this insulation was very effective, and at the end of a season when cold weather catches us ready to shut down I have found that a drop of only thirty degrees in the temperature of the contents has been registered in six days' time.

MR. OKES: Don't they operate during this six days and reheat the oil?

MR. LARKIN: The observation I mentioned was made after the last work had been completed and the oil when left was 200° F. showed a drop of thirty degrees six days later when I looked at the thermometer on the tank.

The temperature out of doors during this time ranged from zero to ten degrees below it.

CHAIRMAN ALLERTON: We would like to hear from Mr. Rex.

MR. REX: I find that whether it pays you to cover your treating cylinders or not depends a good deal on the climate in which you happen to be operating. As our largest treating plant is located in the South, we didn't cover the cylinders for a long time, considering that the outside atmosphere was not cold enough to justify us in doing the work; but after more thorough investigation we decided to lag our cylinders. After investigating the various kinds of lagging available we finally decided upon the plastic lagging as described by Mr. Angier. We use a mixture of one-third lime, one-third sawdust and one-third asbestos, mixing it together just the same as you would plaster for a wall and put it on with cheap labor. We put on three coats. At the end of the first coat, we wrapped chicken wire, one hundred mesh, twelve inches wide, and then left a twelve-inch space between and went on with the second coat and third coat. Put it on the same as you would plaster. We found on a cylinder 132 feet long and 6 feet 2 inches in diameter, where we put on two inches of this plaster that it cost us $314.00 per cylinder. At a point where the outside temperatures are low, we found the saving was considerable. At a point like I have in mind where the outside temperature rarely ever goes below 55 to 60 we find the saving is only about six degrees, but still that is sufficient to pay interest on the investment.

The remarks of Mr. Larkin were very interesting to me on account of covering the tank. We have not covered the tanks as yet, but we are carrying our work tanks at 200° temperature; and I have discussed this question with various engineers who have been accustomed to handling covering propositions and they have told me it didn't pay to cover those tanks. In fact, I had pretty high authorities among the engineers to tell me that it wouldn't pay us to keep that covering on; but this statement is very interesting to me, and I think I shall go back and cover my work tanks.

SECRETARY ANGIER: It would be interesting to hear from Mr. Gibson. He said this morning that since the first of January the temperature at Brainard has been between seventeen and thirty-two below every night. I would like to hear how he keeps things warm up there.

CHAIRMAN ALLERTON: We would like to hear from you, Mr. Gibson.

MR. GIBSON: We shut down (laughter).

CHAIRMAN ALLERTON: I think some one else must have something else to say. As Mr. Berry declines to be heard on the subject, the Chair will explain how the covering was done with our cylinders on the Harriman system. I wish to say in regard to Mr. Yarbrough's paper that it was not only the saving in fuel but by keeping the cylinders warm a greater number of charges can be gotten out. Therefore, there is great economy in that way. The more you do the less the cost is per charge. Now, at our plants our cylinders were covered with wooden lagging at two inches from the outside of the cylinders; that is, a tight wooden lagging which left an air space of two inches between the wood and the shell of the cylinder, and that wood was protected by a covering of galvanized iron with brass bands where the sections joined. These were bolted on, and the whole covering was then painted. That left an absolutely tight air space between the shell, the covering of wood, which is a non-conductor, and the cylinder. We found that very effective. Perhaps Mr. Shipley could give us some information.

MR. SHIPLEY: I don't believe I can.

MR. NEWTON: Mr. President, I understand from a party that has actually done the work that the Standard Oil Company protects all tanks which must be kept hot; that is, tanks for storing paraffine wax, are uniformly covered with wooden lagging. The tanks are first fixed with wooden hoops around it just like a wooden barrel, and then ordinary tongue and groove flooring is nailed right on to those hoops, leaving an air space in between that is equal to the width of the hoops. They always do that. Undoubtedly they do it because it is not only practicable but effects a saving as well.

CHAIRMAN ALLERTON: I have no doubt myself that tanks should be insulated, and of course I think that the best process is that devised by the Standard Oil Company, which is the same as our cylinders that were covered with an air space protected by a non-conducting material, such as wood. Dr. von Schrenk, can't you give us something on this subject?

DR. VON SCHRENK: I don't know anything about that.

CHAIRMAN ALLERTON: Mr. Card, we would like to hear from you.

MR. CARD: Mr. President, my retorts are not covered, but my buildings are built low and I use steam coils made out of inch pipe. I utilize my exhaust steam from my pumps. I let the pumps exhaust through the coils. Undoubtedly the tanks on the outside should be kept warm. I think if we use the coils in the retorts and use the exhaust steam and there won't be much more loss than by having the retorts covered and not using any of the exhaust steam. None of my retorts have a cover on at the present time.

CHAIRMAN ALLERTON: We would like to hear from Mr. Sterling.

MR. STERLING: I don't know anything about that.

MR. TAYLOR: I will have to disagree with Mr. Sterling. He has got the best proposition for a non-covered tank that I ever saw.

MR. STERLING: Of course, we have insulated all our boilers and steam pipes in the usual way with a commercial covering, and the idea mentioned by Mr. Taylor, which really has nothing to do with a retort cover, I got over on the other side. We had trouble with the vapors from the cylinders when the doors were opened, blowing back into the building, and to remedy this merely put a partition across the end of the cylinder house which has the double effect of keeping the engine room and retort house free of fumes and also of retaining the heat. It is a very simple proposition.

CHAIRMAN ALLERTON: Isn't there some one else who can tell us a better way? We have had several methods described.

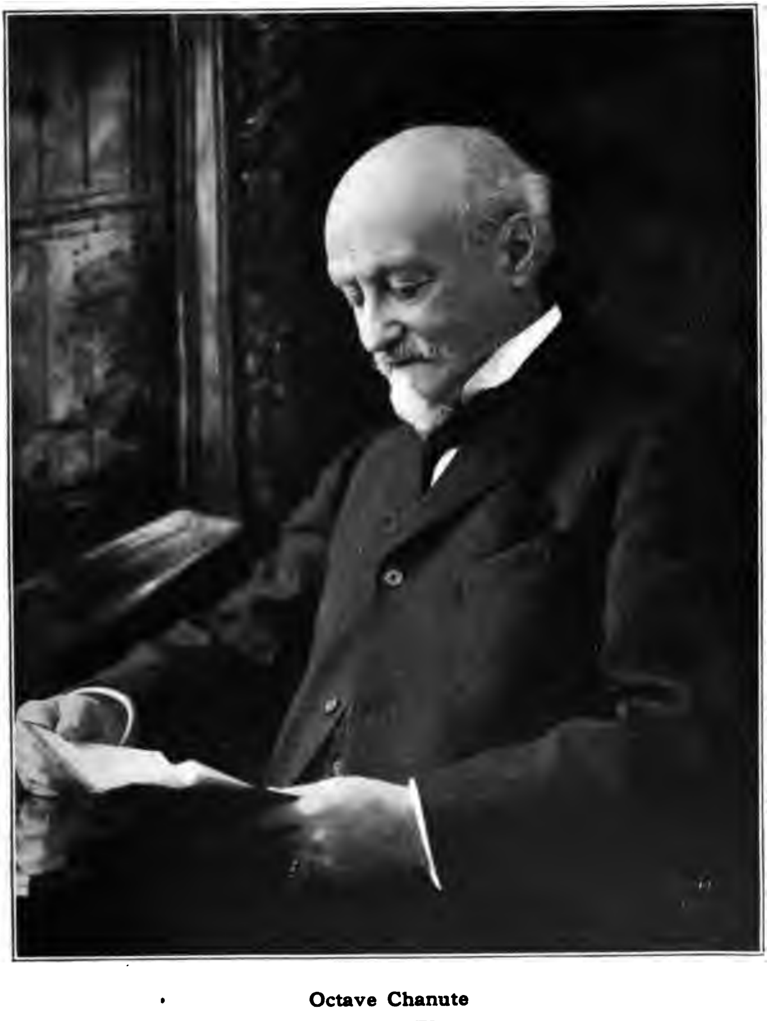
MR. REX: Will Mr. Church tell us what their experience has been in insulting tanks or cylinders?

MR. S. R. CHURCH: We have covered at one of our roofing plants a couple of out-of-doors iron storage tanks into which we blow refined tar from the stills for the purpose of saturating the roofing material. We had steam coils in these tanks, and we desired to maintain a temperature above 250° F. The tar came from the stills about 300° and some times we would want to leave it in those tanks for forty-eight hours without adding any fresh material. The steam coils would not maintain that temperature; in fact, it used to drop to 200° F. We found by covering the tanks somewhat as Mr. Allerton described, only we used asbestos cement for the outer covering instead of wood, we could very readily maintain a temperature of nearly 300° F. in the tar for thirty-six hours with hardly any steam passing through the coils. It certainly paid from that standpoint.

CHAIRMAN BERRY: The next thing on the program is the report of the Committee appointed to draft resolutions in memory of our deceased members, Mr. Octave Chanute and Mr. Samuel M. Rowe. Mr. Allerton is the Chairman of that Committee.

MR. ALLERTON: Your Committee submits the following:

WHEREAS, death has removed from among our number OCTAVE CHANUTE and SAMUEL M. ROWE, two of our



Octave Chanute

Samuel M. Rowe

most beloved and worthy members, both in the fullness of their years,

THEREFORE, BE IT RESOLVED, That this Association set apart a page in its official proceedings in honor of their memory.

"Farewell! O life departed;
Farewell! O sacred urn.
Bereft and broken hearted,
To earth the mourners turn.

Thou art passed to the distant shore
But a little time before;
For thither the swift hours lead us,
Thou dost but a while precede us."

OCTAVE CHANUTE was able by his high standing in the engineering profession to exert a vitalizing influence and a most substantial aid towards the growth of this industry; and both he and SAMUEL M. ROWE devoted to the successful prosecution of this industry the last score of years which has included most of its history in this country.

Beginning with the building of a plant by Mr. Chanute in Laramie, Wyoming, and continuous treatment operations by the Santa Fe Railway with a plant built in 1885 and first operated by Mr. Rowe himself, we have today an industry which, although still in its infancy, treats perhaps a hundred million cubic feet of timber a year; and,

BE IT FURTHER RESOLVED, That copies of these resolutions be forwarded to the bereaved families with the sincere sympathy of the Association.

DAVID ALLERTON, Chairman.
D. BURKHALTER,
J. B. CARD.

CHAIRMAN BERRY: You have all heard the report of the Committee. What shall we do with it?

DR. VON SCHRENK: I don't know whether I am in order to say something further about it?

CHAIRMAN BERRY: Go ahead.

DR. VON SCHRENK: If there is no other business before us, I think it is only due to their memory that we call upon various members for a few words. I will move you first of all that we do act on this motion favorably and adopt the same by a rising vote.

MR. SHIPLEY: I second that motion.

Motion carried unanimously, and every one in the room arose to his feet.

(Mr. Allerton resumed the chair.)

MR. SHIPLEY: Mr. Chairman, I would like to go back to the other subject just for a moment, please. I think there is a great diversity of opinion when it comes to having cylinders and tanks covered. I have visited nearly all the operators at their plants, and in talking about covering cylinders, working tanks and storage tanks, it seems to me that there are very few places where it will pay to cover your tanks. It may be all right to cover your cylinders; but you take Mr. Card's proposition of utilizing the exhaust steam from the machines in the heating coils of cylinders and the same thing can be done in the tanks.

Now, in covering cylinders you can figure that it is going to cost you from fifteen to twenty-five cents per square foot, which equals $400 to about $750 for seven feet by 132 feet cylinders. Suppose you started in to cover your storage tank; take a 500,000 gallon tank, 65 feet diameter by 22 feet high, and it would cost $650 to $1,250, which wouldn't pay. It seems to me that the most economical plan is to arrange your heating system so that the exhaust steam from all your machines goes direct to your coils and through your cylinders and all your various tanks; and then when you haven't got sufficient exhaust steam you can put a reducing valve on your main steam line which will always keep that exhaust steam up to about thirty to thirty-five pounds pressure.

SECRETARY ANGIER: It is not necessary to cover the storage tanks.

MR. SHIPLEY: No; but the subject just came up here about covering storage tanks.

SECRETARY ANGIER: The creosote storage tank is generally kept at about 110° F. It is only necessary to cover the working tank where you want the temperature about 180° or 190° all the time.

MR. SHIPLEY: The creosote in some storage tanks is kept 110°, 125° and 130°.

MR. REX: A small part of our steam is used for power and a good part of it is used in keeping the cylinders and tanks and other places around the plant warm; and while we have experimented fairly extensively with apparatus to distribute that steam around the various points, we have yet failed to find a really successful apparatus that would distribute that steam to all parts of the plant. I would like Mr. Shipley to describe his system.

MR. SHIPLEY: Mr. Chairman, the system I had in mind, and one which will work is used in large industrial plants; and that is to place a reducing valve on the main steam line and reduce the steam pressure from 130 pounds or 100 pounds down to 30 pounds on your heating system; combining with the exhaust steam from the machines, thus the balance will be made up from the reducing valve.

CHAIRMAN ALLERTON: The next subject on the program is, "How can Excessive Insurance Rates Usually Charged by Insurance Companies be Avoided," by R. J. Calder. In the absence of Mr. Calder, I will ask the Secretary to please read his paper.

Secretary Angier then read Mr. Calder's paper, as follows:

In writing on the subject, "How Can Excessive Insurance Rates, Usually Charged by Insurance Companies, be Avoided," my experience is entirely confined to rates applying in Texas, but I take it, that, in a general way, like conditions exist in the other states.

Creosoting plants, except those most modern in their construction, have always been considered hazardous risks, and quite a number of them have burned during recent years. However, every effort has been made to reduce this risk;at the older plants, more effective apparatus for fire protection has been installed and extra precautions have been taken to prevent the starting of a fire. The plants built very recently are practically fire proof, or should be, as the construction of the building and arrangement of the yard governs the rate, in other words, a properly constructed plant carries a very low rate of insurance, and the rate increases in proportion to the defects from an insurance standpoint. For instance, a certain construction is given as standard and it has a certain fixed rate basis, plus the key rate (a term used in Texas, which means the rate applying in a city or town in which the plant is located). This key rate varies in different cities or towns according to the fire hazard in the particular city or town. Having this rate basis and the key rate fixed, an addition is made to the rate for each defect. In using the term defect, it must be understood to mean entirely from an insurance standpoint. I will quote you a standard prescribed by all the insurance companies doing business in Texas:

Standard—Brick or stone building, one story in height, without basement. Roof—Metal, slate, gravel or composition; metal trusses; flooring, brick, cement, stone or earth; boilers to be outside or cut off by standard parapet fire-wall; openings to be protected with approved labeled fire-doors; heating, steam; lighting, by gas (so arranged as not to allow flame to come in contact with woodwork) or by electricity, wiring to conform to National Electric Code. Creosoting cylinders to rest on brick, stone or cement foundations, one such foundation, at least, to be under each section of cylinder; each cylinder to be provided with a safety valve set to discharge at not over 100 pounds per square inch and equipped with 3-inch discharge; pipe from safety valve discharge to be carried at least 100 feet from any combustible material; no shed or other woodwork, excepting necessary platforms, to be built over or around cylinders. Live steam pipes to be kept clear of contact with woodwork at least one inch: superheated steam pipes, where passing through wood partitions or paralleling wooden walls, to be insulated and kept clear of contact with woodwork at least six inches. Adequate supply of approved metal waste cans to be installed; storage of oil in barrels and (or) iron drums to be subject to 200 feet clear space clause. Lumber creosoted and (or) uncreosoted, to be subject to 100 feet clear space clause. Risks combining woodworking hazards of any kind must be rated under woodworking schedule applicable thereto.

Basis	$0.25

Add 50 per cent of Key Rate of city or town.

Note—In cities and towns having Water Works and Fire Department where risk is over 500 feet in a direct line from a city fire hydrant, use as Key Rate $1.00 instead of Key Rate of city or town.

Add for deficiencies as follows: (Charges cumulative.)

Shingle roof	.25
Frame or Iron-clad building	.75
Brick veneer or cement block	.50
Roof trusses and supports, if wood	.10
Iron-clad building, steel frame construction throughout	.15
Boilers	Charge as per Schedule A
Heating, not safely arranged	.10
Lighting, not safely arranged	.25

Floor—(a) If heavy, slow-burning mill construction	.05
(b) If wood, not of heavy, slow-burning mill construction	.15
Walls, less than standard	.10
Approved metal waste cans, none	.10
Frame sheds over creosoting cylinders	.25
Creosoting cylinder foundations, not standard	.10
Creosoting cylinders, not equipped with safety valve as per standard—	
(a) If cylinder under frame shed	.10
(b) If cylinder not under frame shed	.05
Live steam pipes, not safely arranged	.10
Superheated steam pipes, not as per standard	.50

Deductions.

For risks having private fire protection and standard watchman service, i. e., watchman and approved labeled watchclock	20 per cent
For risks having private fire protection and no standard watchman service	10 per cent
For risks having standard watchman service, but no fire protection, excepting as below	10 per cent

Note—To secure this credit sufficient number of casks of water and fire-pails and buckets of sand must be installed.

Rate on creosoting cylinders	50 per cent of rate on plant
Rate on creosoting tanks and on oil in tanks, detached 100 feet, policies to be written subject to clear space warranty, basis.	.10
Add 50 per cent of Key Rate of city or town.	
Rate on oil in barrels and (or) metal drums:	
In each case add 50 per cent of Key Rate of city or town.	
With 200 feet clear space clause, Basis	.75
With 150 feet clear space clause, Basis	1.00
With 100 feet clear space clause, Basis	1.25
No clear space clause, rate same as plant.	
Rate on lumber, creosoted and (or) uncreosoted:	
With 100 feet clear space clause, Basis	1.00
In each case add 50 per cent of Key Rate of city or town.	

With no clear space clause, rate same as plant.

Exposure—

Charge for Exposure as per Exposure Table.

Night Work—

For permit and charge, see Night Work Schedule.

I have given this report in full in order that it might be compared by the different operators in different parts of the country, with the hope that it may be of some service to them. I have gone in detail into the construction of the plant, as affecting the insurance rate, as the creosoting companies can control this, but the laws of each state so vitally affect the rates, either by fixing a maximum rate or by permitting the insurance companies to charge what they will or the maximum that the business will bear, that this feature must be considered. Recently there have been passed by he State of Texas, laws, which require the companies to file general basis schedules, which schedules after being applied have, in some instances, reduced the insurance rates, and, in others, raised the rates. In explanation of the last statement, in most instances the increase in rate was caused by the insured having enjoyed, previous to the application of the general basis schedule, exceedingly low rates, considering the hazard attached to the risk. The opposite being the case when the rates were reduced, though on the whole, probably, the effect has been to reduce the rates. This phase of the question, however, while affecting the rates, is not generally within the control of plant operators.

CHAIRMAN ALLERTON: Gentlemen, you have heard this paper and it is now open for discussion.

MR. TAYLOR: Will Mr. Calder be asked to write a paper on this subject next year?

CHAIRMAN ALLERTON: Why, he can be.

MR. TAYLOR: I should think it would be pretty good experience.

CHAIRMAN ALLERTON: Undoubtedly. He can tell next time about collecting the insurance.

MR. BERRY: Mr. Logan can tell us something about it.

MR. LOGAN: Mr. Calder has pretty well covered the situation in Texas, and as we are only operating in Texas I could only repeat what he said there. Those are the conditions under which we handle our insurance matters under the regulation of state law.

CHAIRMAN ALLERTON: We will now pass to the reading of the next paper, "Difficulties Encountered by Plants in the North that Plants Located in the South do not Have to Contend with," by Mr. Andrew Gibson, Superintendent Timber Preservation and Tie Treating Plants, Northern Pacific Railway Company.

Mr. Gibson then read his paper, as follows:

The conclusions arrived at in writing on this subject are from inference and not from personal observation or experience, the writer not having had the good fortune to observe what difficulties plants in the South have to encounter, particularly in the winter months. At the northern plants we have invariably very cold weather at frequent periods between the first of November and the end of March. This, as you can readily understand, means greatly increased coal consumption and careful watching to guard against freezing pipes and consequent damage to plant. During the same period we have usually more or less snow, which makes it very troublesome handling the cylinder cars through the yard. It is no uncommon occurrence to shovel out a frog and switch, and in less than five minutes have the train stall there and have to do the shoveling over again, so that when you have to repeat this operation about a dozen times a day it means loss of time, and, incidentally, the otherwise amiable temper of the motorman and switchman who want to get out of the storm and jerk the train, sometimes displacing cars and tying up the work for an hour or so.

From what I can learn from operators of southern plants, who have had experience with some of our northern timbers, the opinion seems to be that our Douglas fir, tamarack, and spruce timber is more refractory to treatment than southern woods. Of course, as all treating plant operators know, refractory timber requires longer time to treat and very much more care than ordinary species of timber that take treatment readily. This is one of the all-year-round difficulties, and one that entails additional time, which means additional expenditure.

The last difficulty I can think of at present, which northern plants have to contend with that southern plants do not, is the long haul on treating material, creosote, zinc-chloride, or whatever the material used in the treatment may be. It is heavy and bulky stuff, and freight rates with us in the North is a large item of expense. This material usually has to come long distances and the traffic charges adds considerably to the cost of treatment, sometimes several cents per tie. In the South, or on either the Atlantic or Pacific coasts, you can import creosote in tank vessels from Great Britain or Europe and thereby reduce the cost very materially.

The labor situation in the South I would suppose would be an improvement on what it is in the North, from the fact that you can get colored men, who seem to take to that work, as near as I could judge from my limited experience in the South, like a duck to water. The figures paid are not quite as high as we have to pay to white men in the North, who do not take kindly to handling treated ties, especially creosoted ties, and we find at times a great deal of trouble in keeping good help, particularly in the haying and harvest months.

CHAIRMAN ALLERTON: Gentlemen, you have heard the paper, and we would like to have expressions of opinion on the subject. Of course, we all sympathize with Mr. Gibson, but we would like to have your expression of sympathy. I am sure I sympathize with him because I have lately been exposed to the cold regions of the North. I have seen sun dogs and northern lights within the last three weeks.

SECRETARY ANGIER: Mr. President, Mr. Gibson spoke of the difficulties caused by snow. This is certainly one of the most perplexing problems a northern plant has to contend with. Not only are frogs and switches to be shoveled out, but sometimes entire tracks throughout the yard before the switch engine can set in cars. The Burlington plants have been absolutely out of commission for two and three days at a time during a severe blizzard. By the way, Mr. Waterman is here today and says that when he left Galesburg this morning, there was about a foot of snow on the level and everything tied up. Probably the plant will be on delay for two or three days. I have seen loaded trams literally buried in snow, and have taken pictures of men shoveling snow that was four to five feet deep. Then a little warm spell sets in, and the snow begins to melt, and all of the drains are frozen up. The water gradually covers the tie yard, in many places the tracks are submerged and of course the men will not work. The plant is again closed down or perhaps working half time until the flood subsides or another freeze-up takes place.

In Wyoming it is not uncommon to have weather 25° below zero. I have personally seen it 38° below, and you Southern men who think you are freezing to death when the thermometer gets down to 32° above may think you are laboring under difficulties, but I am sure you would change your mind if you would make your Northern brother a visit almost any time in January, February or March.

The ties, especially when treated with a water-soluble salt, freeze quickly after being taken from the retorts, and are a constant source of danger to the men. Smashed fingers and toes are an every day occurrence. A medical case well stocked with bandages, antiseptic gauze, etc., is one of the chief requisites as well as a handy man who can play the surgical act when ever occasion requires; yet can put in the balance of his time thawing out frozen pipes or punching up the fires to keep the superintendent's blood in circulation.

MR. STERLING: Mr. Chairman, as to these physical difficulties of cold and snow I can tell one little thing that may be of interest. In unloading local hardwood in winter the heavy pieces are often covered with a coat of ice, and in putting them in piles it is impossible to maintain the proper spacing. Moreover we find that these hardwoods, particularly switch ties, that are piled when coated with ice rot very quickly. They begin to decay very early the next summer, while similar timbers unloaded say in the fall will last eighteen months or two years in piles before they show any tendency to rot. That is something I don't know how to overcome unless we quit receiving material in the winter.

In regard to labor and the question of the colored people in the South: Of course, we are not in the South, but there are a great many colored laborers in Philadelphia, and we have found them universally poor. They are not only lazy but they do their work badly; and by a system of elimination we have at last accumulated a force of sixty to seventy men, mostly Slavs and Swedes, but to get them we hired and discharged several hundred men until we got to these big fellows. We find laborers from northern Europe best. They are big, husky fellows, and easily handle hardwood ties that weigh well over two hundred pounds. I mention this in comparison with Italian laborers who are more plentiful, and will work for less money. We got hold of one fellow last year with a chest about two feet thick and shoulders about four feet broad. When he came over he still wore his army cap and had evidently just gotten out of the army in some of these Russian countries. He looked around and said: "In my country, one man, one tie. Me handle that tie." We sent him out and he tried handling ties alone, but was soon glad to have help; but he is the type of man we try to get.

MR. REX: What did you pay the men?

MR. STERLING: Seventeen cents an hour.

MR. WATERMAN: It has been asserted that we pay the men in the North more than the men in the South are paid. I would like to know what they pay for labor in the South. The South pay the darkies more to handle the ties by the piece than we do in the North. I am making this assertion and I want somebody to contradict it or prove it.

MR. BAKER: We pay three-fourths of a cent per tie for unloading to pile in the South and they pay from a cent to a cent and a half for handling ties; am I right, Mr. President?

CHAIRMAN ALLERTON: You can't prove it by me, Mr. Baker.

MR. WATERMAN: I was down the Ohio river a few weeks ago, less than three weeks ago, and they were paying a cent and a half a tie for handling ties.

MR. LOGAN: That is the rate for oak ties also in the South

MR. BAKER: They pay that for handling on the river. We are talking of handling at tie plants. In the South the prices run from a half a cent to three-fourths of a cent per tie at the plant for handling, depending upon whether the ties are unloaded from the car to the ground or from the car to the trams or from the trams to the car. Let me say further that cold is a comparative matter. The naked native in the tropics, on a dreary, dismal morning probably suffers as much as the fur-clad Eskimo in the arctic. It is no colder in Minnesota, comparatively, than it is in Louisiana. Not a bit.

MR. BERRY: I want to remind Mr. Baker and Mr. Waterman that a tie is not a tie. There is quite a difference. Some of these railroads have toothpicks for ties. There is quite a difference between a 6 by 8 by 8 tie and a 7 by 9 by 8 tie. There is only one way to handle ties, and that is by contract.

CHAIRMAN ALLERTON: We might hear from Mr. Burkhalter. He had some Mexicans that handled his ties a year or so ago for three hundredths of a cent apiece.

MR. BURKHALTER: I don't remember the figure you quote. It is just as Mr. Berry says, a tie is not a tie. It all depends on the tie.

SECRETARY ANGIER: Mr. President, I want to say something about those so called toothpick ties. At the Galesburg plant the ties are usually 6 inches by 8 inches by 8 feet, and at the Sheridan plant they are much larger, averaging about three and one-half cubic feet each, and weigh from 150 to 250 pounds, yet the piece work price is practically the same at both plants.

Treated ties are handled by machinery and the size of the tie makes no particular difference. Is that right, Mr. Waterman?

MR. WATERMAN: That is right.

CHAIRMAN ALLERTON: We are wandering from the subject. The subject is the difficulties of operating plants in the North as compared with the difficulties of operating plants in the South, and it has gotten to be a question of handling ties. We will try to get back to the subject. Has any one got anything further to say?

MR. GIBSON: I think Mr. Baker failed to state that when they shiver in the South they take a pinch of quinine, and that shivering passes away; but in the North we can't control it that way (laughter).

SECRETARY ANGIER: Mr. President, I have just recently returned from a trip through the South, and I noticed that at some of the plants the buildings had no sides to them, merely a covering over the machinery to keep off the rain and sun. When you go North you will find not only sides to the buildings, but you will also find that there are numerous steam heating pipes throughout the buildings to keep the treating solutions from freezing.

MR. LARKIN: In connection with the operation of plants in the South and in the North, there are a few difficulties I have noticed, that the paper just read brings to my mind. In the first place there are two of our plants that are very widely different in the nature of their operation, and separated to a greater extent geographically and climatically than any two plants being operated today by any other one company. One in Minneapolis, Minn., and the other in Mobile, Ala. There are a few essential points of difference in the operations of these plants. In the first place considering the complete economical operation of the plant in Minneapolis, it is an absolute impossibility at certain times of the year to operate at all on account of the very severe cold weather common to that locality. By the way there is a big loss on your investment lying idle for such a time, no matter what the duration may be.

But a far greater difficulty an operator has to face is the constant annual reorganization and education of his operating force. We are able to operate at Minneapolis for possibly eight months, sometimes as much as nine months, in a stretch and by that time we have a fairly competent regular force and find they have learned to do very creditable work, having become educated and capable during this time, then when the shutdown comes the men must go to other fields and we seldom find ten per cent of the old force that ever come back the following season, thus every year at the beginning of the season we have to break in a new crew. Now, that, of course, is a big loss and it is a question of educating a large portion of our men to do the same work year after year and each time waiting for them to become competent before we can ever expect a capacity output.

Now in connection with the plant at Mobile, this item of reorganization does not enter in at all, because the climatic conditions are such that a continuous operation is usually possible; but the big difference here is in the labor at hand, and the two difficulties at the Northern and Southern plants mentioned just about offset each other. The Southern darkey is like a child and while you don't have to pay him quite so much, it is absolutely impossible, as a previous speaker has said, to get him to do his work in a satisfactory manner; he must be teased and coaxed or whipped, either method being equally unsatisfactory. To my mind these two essential points of difference must be considered when the operation of plants in the North and the South are compared, as has been doen in the topic of the paper under discussion.

CHAIRMAN ALLERTON: We will now pass to the next paper, "Should Sawn and Hewn Ties of the Same Kind of Timber of the Same Degree of Seasoning be Treated in the Same Cylinder Load," by H. J. Whitmore. Mr. Whitmore is not present, and I will ask the Secretary to please read the paper.

Secretary Angier then read Mr. Whitmore's paper, as follows:

The subject assigned me is one with which I am not very familiar, as my company has not treated sawn cross-ties for something like eight years. The first year our plant was in operation we treated quite a number of sawn short leaf pine ties, which were shipped to the plant in carload lots but were very green and were placed on the yard for seasoning, consequently when we picked them up they were all treated separately from the hewn ties This had been my practice heretofore at other plants with which I had been connected, and I believe this is the proper way to handle sawn ties of all kinds of timber.

My experience has been that timber from which sawn ties is cut, is, as a rule, of a better grade, older growth of timber, and carry more heart wood in proportion than a hewn tie made from the same kind of timber.

Then, again, I beileve it is a matter of economy to treat and handle the sawn ties separately from the hewn, for as a rule your hewn ties are seasoned on line, or at least ours are, and also some from a different locality; the sawn ties coming direct from the mill are, as a rule, green and not ready for treatment, consequently you could not mix them.

I believe the sawn ties should be placed in the track to themselves or as near as possible, for various reasons, and I am of the opinion there is a difference in the price of the two classes; this feature would require a separation at some time or another during the handling.

You can control the treatment better separately than by treating them mixed in the cylinder load as you would then know just what you are doing; consequently, my opinion is that you should not make a practice of treating sawn and hewn ties in the same cylinder load, whether they be of the same kind of timber or not.

CHAIRMAN ALLERTON: Gentlemen, you have all heard the paper and it is now open for discussion.

MR. GOLTRA: While we do not advocate the treating of sawed and hewn ties in the same cylinder, when it can be done separately without extra expense, yet the argument advanced by Mr. Whitmore does not seem, to me, very strong. He says that the sawed ties are usually green, whereas the hewn ties are usually seasoned. We would like to know if there is any reason why he cannot hold the sawed ties until they are seasoned and then treat them at the same time as the hewn ties. The track department of some roads prefer to keep them separate, so that each kind can be laid in the track together, but so far as the treatment is concerned if they are equally seasoned and other features nearly alike, we see no reason why both the sawed and hewn ties should not be treated in the same cylinder at the same time.

MR. BERRY: Mr. President, Mr. Rex can answer that question.

MR. REX: I think I can answer Mr. Goltra's question so far as Mr. Whitmore's paper is concerned. He is so situated that he has not a very large yard and the result is that he seasons all his hewn ties on the right of way and his sawed ties come from the mill. The mill of course has no storage capacity—the sawmills have a storage capacity of but a few car loads, and they want to get the material off the tracks as soon as possible after sawing. The result is that when the sawed ties are shipped to a plant situated as he is they are always green, while his hewn ties are left on the right of way to season and come in to him dry. That is the explanation of why Mr. Whitmore made that point.

MR. LOGAN: It seems to me that Mr. Whitmore and Mr. Goltra, though Mr. Goltra takes a different view, absolutely agree on that point. Mr. Whitmore says that his practice is to treat them separately and thinks it should be done and Mr. Goltra takes the same view. It is evident from this that Mr. Whitmore's practice, as he states there, of received sawn ties green makes it necessary to season in the yard.

MR. MEYER: I agree with Mr. Whitmore that the sawed ties ought to be treated by themselves if possible for two reasons. First: The sawed ties when loaded on tram cars ought to be separated by slats in order to obtain the best absorption and penetration. Second: By placing them in the tracks by themselves a good test could be obtained as to the mechanical life as compared with hewed ties subjected to the same conditions. However, so far as the separation at the Treating Plant is concerned when hewed and sawed ties are received mixed in the cars, I do not believe it would pay to go to any extra expense in separating them. I know so far as we are concerned that it would be nearly impossible for us to do this. We are receiving at the present time not alone hewed and sawed ties in the same cars, but also green, partly seasoned and seasoned ties mixed together, and it is my opinion that it would pay us better to separate the ties according to their seasoning, than it would to separate the hewed and sawed ties. In fact, as stated above, it would be very difficult for us to separate our hewed and sawed ties, as it would require a lot of extra handling and consequently a great deal of extra expense and I do not believe that the benefit derived from such separation would pay.

CHAIRMAN ALLERTON: The Chair will state from his experience that he has always found sawed ties more difficult to treat, that is to get the same penetration, than the hewn ties on an average. Mr. Davidson, can't you tell us something on this subject?

MR. DAVIDSON: We haven't any sawed ties.

SECRETARY ANGIER: Mr. President, when we treat sawed ties exclusively it is necessary to use slats of some kind to allow the solution to get between the ties, but when they are mixed with the hewn ties, as we get them on the Burlington, it is not necessary to use slats. Perhaps twenty-five per cent of the ties are sawed and seventy-five per cent are hewn. If they are mixed you can treat them without the use of slats and without the work that is entailed in using sawn ties exclusively. We get them mixed on the Burlington and I don't see how we could separate them for seasoning, as Mr. Goltra says.

MR. TAYLOR: I think one other point that has not been brought up there is the fact of getting different board measure of sawn ties than with hewn ties. How are you going to work if you do this? What are you going to do on your charge? Treat it as a sawn charge or treat it as a hewn charge? Some plants do not do that—treat the hewn ties the same as the sawed ties. How do you treat, Mr. Angier?

SECRETARY ANGIER: To get the cubic contents, you mean?

MR. TAYLOR: Yes.

SECRETARY ANGIER: We use an arbitrary figure. We say that a charge of ties contains 122 cubic feet. We arrived at that by measuring thousands of ties, and we found that they run from about 118 to about 124 cubic feet to the charge. We use an arbitrary figure, and simply say each charge of ties contains 122 cubic feet regardless of the kind; that is, when they are mixed. Of course, if they are sawed it is a different proposition, but when they are mixed each tram is supposed to contain 122 cubic feet and a charge 1952 feet—sixteen trams.

MR. TAYLOR: That is all right for a railroad, but what about a commercial plant.

SECRETARY ANGIER: How would you get the cubical contents, by displacement? If so, when you blow back, you blow out a good deal of the creosote or the solution that you first put in the tie, consequently you cannot get accurate measurement by displacement. We find it more accurate to take an arbitrary figure. As a matter of fact your so-called 6 by 8 by 8 ties do not always measure 6 inches by 8 inches by 8 feet. A 6 by 8 by 8 tie would measure 2 2-3 cubic feet, but as a matter of fact the ties at the Galesburg plant average 2.85 cubic feet.

MR. TAYLOR: What do your hewn ties average?

SECRETARY ANGIER: I refer to hewn and sawn mixed. The mixed load will average 2.85 cubic feet per tie at the Galesburg plant, or at least that was the average when I was in charge of the plant a year ago. As stated before, ties at the Sheridan plant will average about 3.5 cubic feet. They are mostly pole ties.

CHAIRMAN ALLERTON: I think that the calculated measurement of ties in a charge must always be more or less arbitrary, no matter what the method of calculation is.

SECRETARY ANGIER: If we take one of our tram cars and load it with ties we can get on just so much bulk, and if we load it to its maximum capacity we cannot get any more than an average of 122 cubic feet. If we load it to two-thirds of its capacity, of course we get less, but we impress upon the men that they must be loaded to capacity, and if they are not loaded to the entire satisfaction of the management, the men are obliged to reload them. Each tram is supposed to contain 122 cubic feet of ties, and for all practical purposes this is as near as we can get at it unless we measure every tie.

MR. BERRY: Do they do it, Mr. Angier? Do your men do it?

SECRETARY ANGIER: They do, or they do not get paid for it.

MR. BERRY: Do you get as many hewn as sawn?

SECRETARY ANGIER: No, not if we are using hewn ties exclusively, but I am speaking of the mixed load.

MR. TAYLOR: Suppose you are treating ties by the cubic foot, are you allowed to assume the same number of hewn ties as you are sawed ties?

A VOICE: Ought not to.

MR. TAYLOR: Here is a gentleman that says you ought not to. That is an operating proposition for the commercial plant.

MR. CARD: What do you mean by hewn ties? Do you mean split ties or pole ties? I think Mr. Angier is talking about split ties. I believe you are probably referring to pole ties. There is a good deal of difference between split ties and pole ties.

MR. TAYLOR: Well, of course, a pole tie.

MR. CARD: Mr. Angier is speaking about a split tie.

SECRETARY ANGIER: I would like to ask Mr. Taylor if he figures his ties in board feet, and is so how he does it, when there are pole ties or irregular shapes?

MR. TAYLOR: Back to your arbitrary proposition we fix 36 board feet to a 6 by 8 by 8 tie.

SECRETARY ANGIER: Your ties are not all 6 by 8 by 8.

MR. TAYLOR: If they are not then the fellow who buys gets the advantage—if they have got toothpicks like the Burlington.

SECRETARY ANGIER: Get that out of your mind about the Burlington ties being toothpicks.

MR. WATERMAN: I rise to a personal privilege. We are not treating toothpicks down there (laughter). Anybody knows that there are more board feet in a hewn or a pole tie than there is in a sawed tie. I can readily see and these men who are treating ties commercially must have more for treating a pole tie or what is termed a hewn tie than they would ask for a sawed tie, but it is up to them to separate them. The question is, as I understand this paper, is it economical to separate sawed and hewn ties for treatment. I would say it was for a commercial plant, but not for a plant that is operated by a railroad.

MR. STERLING: Mr. Chairman, I would like to ask Mr. Taylor what board feet has got to do with it anyway.

MR. TAYLOR: Here is the proposition. We get so much a tie for ten pounds per cubic foot. If you have 32 board feet to a tie, that is less than 36 board feet, isn't it? It is an arbitrary proposition. The average 6 by 8 by 8 tie has been considered to contain 36 board feet.

MR. STERLING: I don't know of any treating plant talking about board feet in ties.

MR. TAYLOR: I do, though.

CHAIRMAN ALLERTON: Well, the board feet do come in evidence if you are paid for so many board feet, but in the actual treatment you use cubic feet, don't you?

MR. TAYLOR: Why, yes.

CHAIRMAN ALLERTON: How do you do, Mr. Sterling?

MR. STERLING: We mix them the way the Burlington does.

MR. ROLLINS: In the discussion of this question of hewn and sawed ties the Program Committee hoped to bring out the proportion of the amount of treatment for sawn and hewn ties. Some of us are of the opinion that sawn ties as a rule are more difficult to treat than hewn ties, and we would like to hear some expression by some of the members as to that feature.

CHAIRMAN ALLERTON: I have expressed my opinion on that. I said it was more difficult to get penetration with sawed ties than with hewn ties. Now, of course, any opinion contrary to that we would like to hear. How do you stand on that question, Mr. Rollins?

MR. ROLLINS: Sawed ties are more difficult than hewn ties.

MR. NEWTON: I think we have been talking about hewn ties and a distinction has been made in regard to split ties and pole ties. Now, where sawed ties are mixed with pole ties undoubtedly the pole ties will get more oil per cubic foot than the sawed ties, due to the fact that the pole ties will have a larger percentage of sap wood than the sawed ties. However, in treating split ties, which are called hewed ties also, with sawed ties, that difference in percentage of heart and sap would not be so apparent, and the uniformity of treatment be much greater.

MR. ROLLINS: My experience has been that there is a larger per cent of sap in the hewn tie than in the sawn and necessarily a larger per cent of heart in the sawn.

MR. BAKER: Are you talking about pine ties (laughter)?

CHAIRMAN ALLERTON: I don't think they had that in mind.

MR. BAKER: If they are, I will settle it so far as this question is concerned. The hewed ties are made out of young trees; they are pole ties; they are nearly all sap, and the sawed ties are made out of older trees. They box them out in the mill, and generally the heart of the tree is put into the tie and the sawed tie will take very little solution in proportion to the hewed tie on account of the large percentage of sap in the latter. You cannot mix them without the hewed ties taking the greater part of the solution. That applies to pine.

MR. BERRY: Mr. Baker is in the South.

MR. STERLING: If they are talking about pine I will settle it the other way. The pine ties, long leaf, square hewed may be cut out of "young" trees, but youth in our ties means from one hundred years old and up. In other words, the long leaf pine is of slow growth, and in the South Atlantic States, particularly Florida, many of the trees are small, although mature and very old. This applies to sawed ties as well as hewn.

MR. BAKER: Did I use the word Texas?

MR. STERLING: No.

MR. BAKER: Well, I will say Texas.

MR. STERLING: All right, you are probably talking about loblolly.

CHAIRMAN ALLERTON: Mr. Logan, did you have something to say on this subject?

MR. LOGAN: I was going to suggest that point of difference. It would be more appropriate to put the question as to whether it would be proper to treat heart ties and sap rather than sawn or hewn, as was brought out clearly by Mr. Sterling and Mr. Baker. The mode of manufacture in the different sections of the country are not identical. It is a question of heart and sap together and not sawn and hewn together.

MR. GOLTRA: The question of separating hewn ties from sawed ties is only one of the many suggestions that have been offered in regard to the separation of ties for treatment. It has been suggested that they would be grouped in many ways, for instance, according to their degree of seasoning; or their degree of absorption or permeability; or as to the proportion of sap wood and heart wood; or as to their density or specific gravity or hardness, and so on, ad infinitum. If we attempted to separate the ties into so many groups so as to have all the ties alike in these respects, we could scarcely treat more than one tramload or 50 ties at one time. We are of the opinion that it would involve considerable expense in order to get together enough ties to fill a retort, according to the above grouping, and we do not think it is necessary to separate hewed ties from sawed ties. If the ties are already separated, and each kind can be treated separately, just as well as not, and if the advantage gained more than offsets the expense of grouping them, then we would treat them separately but otherwise we would not go to any extra expense in separating them. Mr. Whitmore states that sawed ties, as a rule, contain a larger proportion of heart wood than hewn ties. That is true, but the ties should not be separated on this account alone. This is only one of the many factors entering into the problem of segregating timbers for treatment. Much depends upon the method of treament. If the method of treatment consists of injecting a limited amount of oil or solution per tie, the sapwood will naturally absorb most of it but if the ties are treated to refusal the sap will get all that it can contain and then the heart will take all that it can carry, and by this process it would be unnecessary to separate the woods according to the proportion of heartwood and sapwood.

CHAIRMAN ALLERTON: Is there anything further to be said on this subject?

The next on the program is a talk by Dr. Herman von Schrenk on, "Wood Block Paving in Europe."

Doctor von Schrenk was received with applause and spoke as follows:

Mr. President and Gentlemen: I must apologize to you for having no written, formal discussion of this subject, but the notification of your Secretary or of your Program Committee came to me at a time when I anticipated having considerable time to devote to this subject. I then promised to try and write a paper, but I was called abroad and spent three months in Europe and have just gotten back, and since my return I have found very little time to prepare a formal paper on the subject.

I want to say, first of all, that the subject assigned to me by the Program Committee was entitled, "Why the Present City Specifications for Wood Block Paving Are What they Are." In other words, why do the present cities have creosote specifications as they do? I replied to them that I could write a very brief paper and simply say, I don't know.

There is probably no subject in the last two or three years which I know of, considered from a technical standpoint, that has aroused as much discussion among practically every class of men engaged in that industry as the question, what is the proper creosote oil specifications not only for paving blocks but for every other class of timber?

What I have to present to you today are simply a few observations which I was able to make recently abroad and to refer to a number of conditions which we find here in this country today.

When paving blocks were first treated it was a natural proposition to treat paving blocks just as any other material was treated; and in the early days of creosoting history, particularly in this country, and for a long time, as many of us know, in many instances anything that looked black and smelled bad was satisfactory for creosote and was put into the wood. The remarkable fact about the whole proposition is that a great many paving blocks, as well as other timbers, were treated with that quality of material and have lasted an unusual length of time. Failures have occurred, to be sure, but many of them have gone quietly by the board, because nobody said anything about that; but irrespective of that fact we can't close our eyes to the fact that a great deal of the material treated with oils of unknown quality has given very excellent service; and I think you will agree with me before I get through (and all of those who have worked on this subject will probably come to a similar conclusion) that a simple specification is the best.

In England, Germany and France more work has been done than with us on similar problems. Paving blocks were treated in London a great many years ago, and treated with what was universally known on the English market as London oil, which is the same material that the railroads use today and have used for a great many years for the treatment of ties. When American students of timber treatment first went over to England and visited the various engineers of the cities or of the railroad companies irrespective of what materials they treated, and asked what service they got out of treating materials, they were universally met with the answer: "Most satisfactory, indeed." From paving blocks we get a mechanical life of seven to fifteen years or more, depending on the traffic; ties last twenty-five to thirty years. They found the same thing in Germany, Denmark, France and practically every country that they went to.

An astonishing fact to the American student when he examines the specifications under which the European cities and railway companies are working is the startling difference in their specifications in what to us has seemed for a long time the most important clauses. In other words, you find in England that the specifications require a certain percentage of tar acids in the oil. You get over to Denmark and there the requirements are very different. The same is true in France and Germany.

When you ask about the length of life of preserved timbers, they all say from twenty-five to thirty years. The inevitable conclusion one comes to, after seeing that state of affairs, is that it doesn't make such a great difference as far as the individual compounds contained in a creosote oil are concerned. I have never been able to find any two men responsible for large creosoting operations who are definitely agreed as to what a creosoting oil should be.

This at first sight seems rather strange, but a little investigation will disclose a possible reason why we find a condition of the kind described existing. If you go back to the early history of the creosoting industry in Europe you will find that the use of creosote for treatment was a more or less accidental matter. There were large plants along various lines or roads and various larger cities which produced coal gas tar. Certain portions of that coal gas tar was distilled off for various purposes. There was a small portion which at that time was of no particular value, and gradually it came to be used for the treatment of wood. That condition has not changed materially for a great many years, and is practically the condition in Europe today.

The English railroads use the creosote oil which has been made by the same gas plants and the same tar works year after year. In France and Germany they use the oil made along their lines of railway. The reason why there are so many different specifications is that there are many different oils, all of which have been used for many years and given good results. The engineers in the various countries will tell you: "We are using that specification because that fits our oil." And one answer given to me by an engineer in England this last year when I asked why he kept the tar acids in his creosote oil specifications and whether he thought that they were necessary, said: "Oh, no." I asked "Why?" and he said, "Well, my predecessor had them in and his predecessor had them in and the one before him had them in." And when asked if he didn't think there would be advantage in changing that specification he replied, "What is the use of changing it? We get a good oil!"

In other words, their specifications are not the result of the kind of work that we in America have been doing, but it is the result of fitting the specification to the actual oil obtained. That is practically what it amounts to. In the early days nobody had any specifications; in fact, some of the railroads or cities have none today, i. e., specifications as we understand them. The Caledonian Railway in Scotland specify that the material shall all be treated with pure coal tar creosote; having at least twenty-five per cent of constituents that do not distil over at 600 degrees Fahrenheit, and must contain not less than nine per cent tar acids. There is no requirement as to specific gravity, method of analysis, residues, etc., and the engineers see no reason for being more specific because the oil they get is good, has been good, their ties last, why should they change?

Turning to the paving block situation, as it prevails in Europe today: As I stated before, the paving blocks in England today are treated with practically the same kind of oil that they were treated with years ago. You must not always be too critical of the specifications, because the specifications in England are just the same, fortunately or unfortunately as we may look at them, as is the case with many of the specifications in this country. The specifications are all right, but whether the material is always exactly that specified is neither here nor there.

In Germany there is very little of the paving block industry; it is a comparatively new thing. A very similar state of affairs exists in Austria. The largest paving contractors, upon being asked to present specifications for the various cities, stated they hadn't any. "No paving block specifications?" "No, that is all entrusted to the creosoting company that furnishes the paving blocks." A blessed situation for the creosoting company (laughter). Never had any paving block specifications. They treat the paving blocks with the same oil as they use to treat ties, telegraph poles and other material. I may say for that creosoting company that they do as good work as any seen in Europe.

Such is, I say, practically the situation in Europe. I won't speak very much of France, because the French as a rule have very different ideas of treatment from ours, and any one observing the streets in Paris will probably agree with me that that is one city which we do not want to imitate in our method of operation; because worse paved wooden streets I have never seen anywhere with very few exceptions. That may not be entirely due to their treatment; probably as much to the laying as anything else.

Now, coming to the United States. The early block, as I stated before, were probably treated with creosote. We have no records that are definite as to exactly what they were treated with. We have all seen samples of paving blocks laid in Galveston and other cities twenty-five and thirty years ago which, so far as our information goes, were treated with straight coal tar creosote such as is used at the present time. There is no evidence to prove what it was.

But when the wood paving block industry began to grow a general tendency developed to treat blocks in a different manner from that practiced in Europe. It was argued that it was not sufficient to treat the paving block for the purpose of protecting it against decay, but that another thing that had to be done was to increase, if possible, the hardness, the wearing power and the resisting surface of the block and also to decrease the possibility of water absorption. The first move made was to increase the waterproofing power of oil by mixing resin with ordinary coal tar creosote. Later that was followed by various efforts, some more or less successful and some very successful indeed, of increasing the gravity of the creosote oil by the addition of various tars.

Not until last year, however, was a definite stand taken on the part of the municipal engineers, officially permitting such addition. This, I think, was a very desirable step. The definite statement on the part of municipal engineers, that they would accept what practically amounted to refined tars for the treatment of paving block and made it possible to openly mix creosote and coal tar. Without entering into a discussion as to the justification of putting in heavier materials, or to what extent the additions of tars may or may not increase or rather decrease the absorbing capacity of the wood block, the actual state of affairs today is that the majority of municipal engineers—and probably there is no body of men in a better position to judge as to the actual experience in the street, because after all their maintenance accounts are the things that tell—these engineers have today almost unequivocably and without any dissenting voice decided that the most desirable thing for us is to treat paving blocks with an oil composed entirely of coal tar creosote, to which a certain amount of tar has been added so as to increase the waterproofing capacity of the block and to combine the two features of preservative activity and waterproofing activity.

I brought with me today, as a mere matter of interest, two or three blocks. These blocks are cut in the middle to show what has happened, and I will let these paving blocks speak for themselves. Here is a paving block which was laid right out here on this street (Michigan Ave.), ten years ago. I wish to call your attention to the penetration. This is only one of a great many hundred which have been examined within the last few weeks.

You will note in the very highly resinous blocks two things of particular interest—sap wood penetration and, furthermore, that the wearing surface of this block has gone down not quite one-quarter of an inch.

Here is another block of similar character taken from Michigan Boulevard. These blocks were selected at random and were sawed through without any particular reference to what they might contain.

Here is another block taken from Washington Boulevard, St. Louis. This was taken up with a number of others to make a sewer hole. I believe that this particular block was laid over nine years ago. What the oil was which was used in treating these particular blocks, I am unable to say, but my impression is that they were treated with very heavy coal tar creosote. We have analyzed the oil and it shows an ordinary heavy coal tar creosote used in treatment. Matters of this character I think are of very great interest to us now-a-days, particularly as they show the trend of modern work.

Here is another specimen of a block such as is being treated by the firm of Guido Rütgers, at the present time in Vienna, of wood which is perfectly unsurpassed as far as its wearing quality is concerned. The showing, I may say, is not quite fair, because the penetration is not as good as it looks here. Incidentally, while I am showing these blocks, here is a rather interesting development which is taking place in England, that is, the use of beech paving blocks. The cities of Newcastle, Leeds and other communities in northeastern England have been using beech for many years, and I was told that these beech blocks make the finest paving blocks they ever had. Not only are they very easily penetrated, but they give the very best and most excellent wearing surface. The advantage of the beech over many other woods is the perfect ease with which it can be penetrated and the perfect similarity of the wood fiber which gives a very thorough and equable penetration with oils.

To finish these rather rambling remarks, there are of course a good many problems in this connection which are not yet solved; and as I was to present the general topic for discussion, I want to refer briefly to the other materials than creosote with which paving blocks can be treated. There are offered for sale other tars than straight coal tar and particularly is water gas tar being urged for timber preservation and is being advocated for the treatment of paving blocks.

The chief difficulty with substances of that character, both here and abroad, is our present lack of knowledge of their exact value. Not having any very definite knowledge upon which we can base recommendations involving the expenditure of considerable money with considerable risk, it is very necessary to start work to obtain exact information. We should insist that trials be made with these substances under legitimate conditions and under the auspices of somebody who is thoroughly competent to observe them, in various places and under various climatic conditions, so that a thorough and fair test can be made of them on a sufficiently large scale, so that a practical result will be obtained.

The objections to the water gas tar today which I have and which a good many others have, are taken from the standpoint of the uncertainty of the risk. Water gas tar may be every whit as good as heavy coal tar products, particularly creosote oil, but whether it really is, I don't know. To what extent water gas and other tars are going to be applicable to the industry of wood paving, is for future determination; but I welcome the many open minds now interested in this subject. We ought to do what experimental work we can, and we ought to see that the experiments are properly looked after. I have no doubt that if large quantities of water gas tar or other tars are produced, as we know they can be produced, the time will come when we will know definitely whether they can be used, and if so, we will have a specification such as the city engineers have today, admitting coal tar addition. We will have to consider blast furnace tar, water gas tar and various other substances not now available.

I think the subject is one of the most fruitful for further development, and I think the rapid progress which the wood paving block industry is making is something which is encouraging to all engaged in the wood preserving industry. I am sure if a person has once lived on a street where the wood paving blocks are used, he certainly would never live anywhere else. I thank you, gentlemen. (Applause.)

CHAIRMAN ALLERTON: Now, gentlemen, you have heard Dr. von Schrenk's talk, and if any of you have anything further to say on the same subject, we would be pleased to hear from you before adjourning.

SECRETARY ANGIER: Mr. Chairman, I move that we extend a vote of thanks to Doctor von Schrenk for his very interesting and instructive talk.

MR. LOGAN: I second the motion.

Motion unanimously carried.

SECRETARY ANGIER: Mr. Sackett, of the Forest Service, has requested me to call the attention of the members to the importance of getting statistical information from the different plants, and I cannot do better than to read this memorandum which he has placed in my hands:

In 1910, the Forest Service, in co-operation with this Association, secured from the various timber treating plants throughout the country, statistics covering the amount of preservatives used by them during 1909, their sources, and the classes of material on which they were used.

These statistics were so much appreciated by the wood preservers and by the general public, that the Forest Service has decided to make their collections an annual feature of its work. The office of Wood Utilization of the Forest Service, which has this particular work in charge, will send out this week to all timber treating plants a request for information similar to that which was secured last year.

As you all know, the value of such statistics depends to a very large degree upon the promptness with which they may be issued. On this account, and since this information is of particular interest and value to the wood preservers, I wish to ask all of you who receive these requests, to promptly fill out the cards and return them to the Forest Service. The method of securing and publishing the information collected is the same as that employed by the Census, and other Federal bureaus.

The information given will be considered strictly confidential, and nothing will be published which will in any way reveal the identity of individual operations.

A copy of the final report also will be mailed to those who furnish information.

As I have said before, this work is carried on co-operatively by the Forest Service and this Association, and your courtesy in making every effort to give prompt assistance to the Service in this work will be much appreciated.

SECRETARY ANGIER: Mr. Chairman, I move that we adjourn until tomorrow at ten o'clock.

MR. GOLTRA: I second the motion.

Motion carried.

And thereupon an adjournment was taken till Wednesday morning at ten o'clock, January 18, 1911.

WEDNESDAY MORNING SESSION,
January 18, 1911.

The meeting was called to order by President Buehler at ten fifteen.

THE PRESIDENT: Has the Secretary received any communications?

SECRETARY ANGIER: Here is a letter from Mr. W. Green, Secretary and Librarian of the State Horticultural Society, Des Moines, Iowa:

Des Moines, Ia., Jan. 4, 1911.

Walter Buehler, President, Wood Preservers' Association, Chicago, Ill.

Dear Sir:

I regret that other engagements will prevent me from attending the convention January 17th to 19th, at Chicago.

Am in sympathy with your efforts to conserve our forests and hope your meeting will be successful.

Yours truly,
W. GREENE.

THE PRESIDENT: The first paper this morning will be by Mr. J. H. Waterman on the piling of timber.

Mr. Waterman then read his paper, which is as follows:

Mr. President and Members of the Wood Preservers' Association:

Your worthy Secretary asked me to write a paper on the following subject: "How to Pile Lumber" or "Piling Timber."

When I was a little boy out on the farm, about the first thing I learned was when we went into the woods in the winter and cut our logs and took them to a sawmill and had them manufactured into lumber, was to see that the lumber was properly cared for after it was returned from the mill. There was no chances taken. It wasn't thrown down in a pile promiscuously, but each kind and size was separated carefully and stripped so that the air could get through it and it could thoroughly season, so that in my earliest boyhood one thing which has stood me well in hand since that, is that after timber had been cut the first thing to do is to see that it is properly piled so that it would season.

It is hardly necessary at a meeting like this where every man knows, and most of them know a great deal about the preservation of timber, to state that it is impractical to handle timber and expect to get good results from treating the same, unless the timber has been thoroughly seasoned before we try to treat it. This is not new to any of you, but the story which I will tell you here may be new.

"I knew a friend of mine who had charge of a Timber Treating Plant, who was having some difficulty with the process which he was using. He wired a friend of his and asked him to come and see him and see if he could not solve the difficulty. The friend answered, "See that your timber is seasoned and your emulsion hot and you will have no trouble."

That tells the story in a few words.

Now how to pile timber so that it will season properly seems to me a very easy question to answer. I have been a close observer

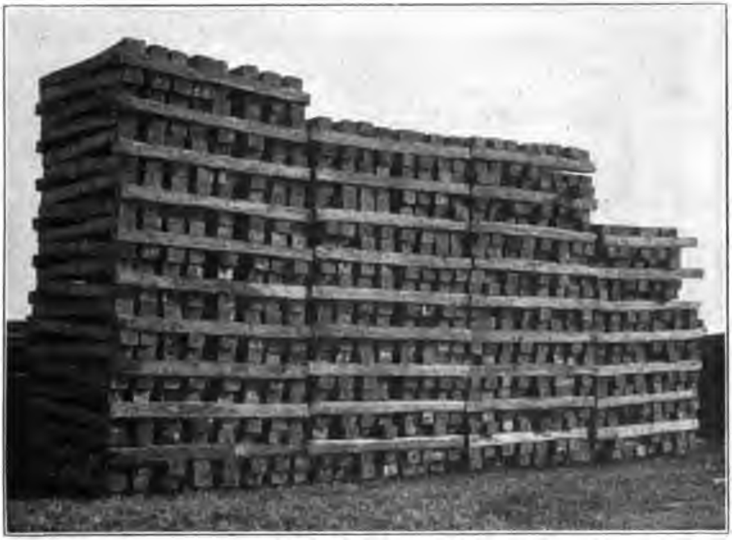


EXHIBIT "A."

for a number of years and have had the pleasure of being around at a number of different Tie Plants. The best way from my observation to pile ties for seasoning is to pile them in piles known as one and eight, and this is the way we pile them now at the C., B. & Q. Tie Treating Plant at Galesburg. (Exhibit "A.")

Referring to piling, that would seem to be more difficult. I have two pictures illustrating how I would pile piling. You will note we use two bearings (Exhibit "B"), not three. I am not in favor of three bearings, for you do not always get them level. If you have two bearings there is very little trouble, and even if they are not level, they do not warp or twist the piling or timber. Then you will notice we pile them in square piles, stripping each tier. The strip should come directly over the bearing. You will note that we piled them twenty high. Someone says this is very expensive. Not so, with a good up to date modern crane. You would be surprised how cheaply we pile these, an average of 5c per stick.

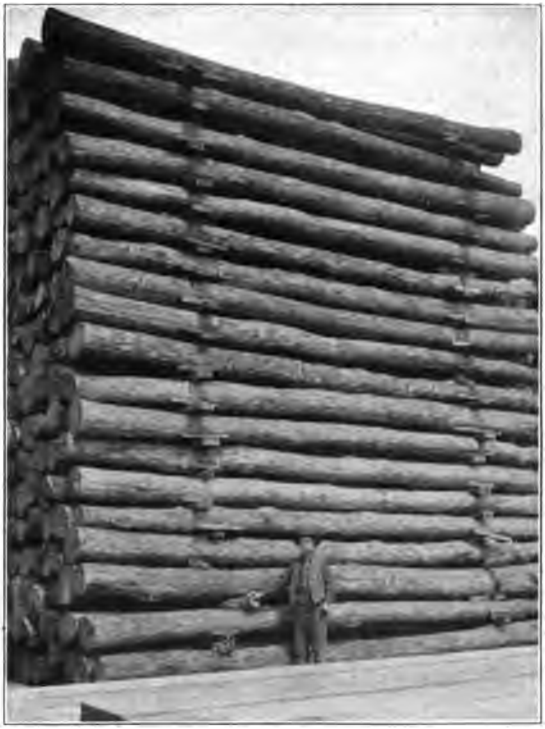


EXHIBIT "B"

The second picture (Exhibit "C") gives you a view of the piling yard and also several piles piled as I have stated above.

EXHIBIT "C"

Piling lumber, three-inch timber and heavier, I believe should be piled on two bearings only, not three, for the reason that you avoid springing your timber if the bearings settle unevenly or if they are not put in level or true, as they should be. Then it takes less strips with two bearings than three. In piling timber one end should always be kept plumb and straight, and the strips should be directly over the bearing or foundation. If this is not done the timbers are apt to warp and twist. Of course, I understand that timber forty, fifty or sixty feet long should have more than two bearings. I refer to what we might term standard lengths, from twelve to twenty-four feet. Aside from seeing that the timbers are stripped properly between every tier, every piece should be separated from a half to one inch. This will give the air a chance to circulate through the pile and you will find they will season without mildewing or otherwise injuring the timber.

Switch Ties would come under the class of timber, and a great deal of pains should be taken in stripping and separating each stick.

I have known ties and I have seen piling that I would say was absolutely worthless and ought not to be treated, some of which had not been cut only a few months, possibly three, simply because it was not properly cared for and properly piled to season.

You men from the South, where you have long wet seasons in April, May and June, and timber cut in those months and left to lay in the woods or hauled on the right-of-way of a railroad or on the bank of a river and throwed in solid piles, will bear witness to this fact that oft-times in less than two months the sap will sour, the fungi will start to grow, and then, in my judgment, the timber, whether it is timber, piling, ties or lumber, is worthless for treatment, and I do not think this Association can emphasize enough the fact that timber not properly piled ought not to be treated.

It is not long ago, less than thirty days, that I was in a tie yard. I will not state whose or where it was, but 50% of the ties, in my judgment, were absolutely worthless because they were not properly piled, and there was over a million ties in the yard; and if any of you gentlemen have traveled around very much and kept your eyes wide open, as I have reason to believe you have, you have seen more timber destroyed and become absolutely worthless because it was not properly cared for after it was cut, in other words, because it was not properly piled, than you have seen destroyed from any other way; and isn't it a fact that most of the timber which becomes sap rotten and full of fungi, so that the sap becomes worthless is because there is not enough care taken in piling the same after the timber has been cut in the woods.

If I can refer once more to my farmer days, and we sometimes can learn a good deal from men who have spent their early life on a farm, and in the woods, you will note this, that when they cut fence posts or any other timber in the woods they never throw it down on the ground and let it become soggy, but what do they do? They set it on end, they put it up in some shape so that it will dry, so that after it rains or if the weather is damp, or warm, or for any reason the sap is liable to sour or mildew, that the air can circulate through it and evaporate the moisture and so preserve the wood in first-class shape.

You take a beech stick or a birch or a soft or hard maple and cut it in March, April, May, June or July, and let it lie in the woods six weeks on the ground and it is worthless.

Gentlemen, I thank you for your attention, and there is no doubt many of you know very much more about piling timber than I.

MR. BERRY: How high do you pile your ties?

MR. WATERMAN: Well, there they are (indicating photograph).

Mr. BERRY: I can't tell how high that is.

MR. WATERMAN: Twenty to twenty-two high.

THE PRESIDENT: Gentlemen, this is not only very interesting, but it is a subject of vital interest, especially to men in direct charge of operation at the plants. Now, the question of the way to stack to season is probably of more importance in the South than it is in the North. They have some serious problems to consider in stacking timber in the South, and on this question I would like to hear some of the men in charge of operating plants in the South as to their experience in piling timber, how it should be piled and how long it is safe to allow timber properly piled to remain in the yards. I see Mr. Rollins, who is from way down South, and I would like to hear from him.

MR. ROLLINS: The conditions we have in the South, of course, are altogether different from conditions surrounding plants located in the North and Middle West. We have found a good many peculiar things in seasoning timbers, ties, etc. We have seen timbers that were given every precaution in order that they might season properly and yet in a very short time, we would find those timbers decaying, possibly due to the species of timber and climatic conditions that exist there.

The open pile or stack, as Mr. Waterman says, 1x7 or 1x8, is recognized as a standard method for stacking ties for seasoning. Where the tie has reached the plant in a green state and the ties are piled in this way they can usually be handled judiciously; that is, they can be treated before there is any damage from rot or decay; but it is invariably the case that the ties are not properly cared for from the time they are cut until they are turned over to the transportation department to be transported to the treating plant. I think that the most serious trouble that treating plants located in the South have to contend with in regard to the proper seasoning of their timber, ties, etc., is the fact that the material has not been properly cared for before it reaches the plant. Another point at issue with us is that we have timber that will not stand to take the same amount of seasoning in our climate that it will in the North or Middle West.

Another feature is that very often the timber ordered is needed before the order is placed. The treating plant management is pressed by the people placing the order to rush the material through the plant. Of course, in the face of a proposition of this kind it is not possible to air season the timber before treatment; this, together with the fact that some of our timbers will not season in our climate before they decay, are some of the reasons for the continued use of the steaming of timber, ties, etc., before treatment.

There is possibly a good deal more that might be said along this line, but it is a subject that has been discussed at previous meetings, and there are others here from the South and we would like to hear from them.

MR. WATERMAN: What is the most difficult timber to season in the South?

MR. ROLLINS: Loblolly pine.

THE PRESIDENT: Any further discussion?

MR. BERRY: We would like to hear from Mr. Rex, Mr. President.

MR. PRESIDENT: Mr. Rex, what has been your experience?

MR. REX: We, as you perhaps all know, air season our material before treatment. We are so situated we don't have to steam. It is true, however, that one has to be rather fortunately located as to climate to be able to do that in the South. As I know the conditions in the South most of the plants would be throwing their money away to undertake to air season their material before it was treated. Our material all comes in from the right of way, and is seasoned through the storage yard. We are particularly well located as far as climate is concerned. On that account we pile our sawed ties entirely separate from our hewn ties. We pile the sawed ties in a two by nine pile and carry them up similar to Mr. Waterman's plan, usually carrying them from fourteen to sixteen feet high. We use treated stringers on the bottom and pile the sawed ties, which are 6x8 inches, the two outside ties on edge. For the hewn ties we use the regular German method of 1 by 8. The larger part of our ties are pines, of course, and we find very little difficulty or loss from this kind of a tie on account of decay in seasoning. The last two years, however, the other woods are coming in, the gums and the oaks, the beech and the magnolia, and we find there is considerable loss in the seasoning of that kind of material, and before we learned a great many things about this we lost some material in the seasoning, especially in gum ties. We now have settled, however, upon five months as the proper period for air seasoning of gum ties before treatment. Our red oaks we season eight to ten months and our white oaks, which we have not treated to date, but which we are now going to treat, we are figuring on keeping from ten months to a year. I would like to hear an expression from some of those treating white oaks on this particular point of seasoning to know what they do, and whether they find that a year is sufficient to season the white oaks before treatment.

THE PRESIDENT: Mr. Rex, I would like to ask is it your practice now to season timber other than ties?

MR. REX: Yes, sir, we air season everything.

THE PRESIDENT: Is that an exception or is it the rule among the members in the South today? Do users of timber sort their timber so that it can be seasoned? I am not speaking of ties.

MR. REX: I rather think that it is the exception. As I say, you have to be located in a particularly fortunate place to be able to hold your material long enough to air season. We feel that our location is particularly fortunate for that very reason.

THE PRESIDENT: Of course, you all know the ideal, but some times the ideal is not always practical, and I was interested to know whether this case at Mr. Rex's plant was the exceptional case or one of standard practice. There is one point that has not been touched upon, and I would like to ask Mr. Waterman in the stacking of beech ties what his experience is in checking.

MR. WATERMAN: Well, I don't think we experience very much trouble about the checking of beech. The trouble is to get the beech tie in the yard before the sap sours. Beech cut from March to September will sour very quickly. If we can get it in the yard and stack it up, we don't have any trouble with it.

MR. CARD: Mr. President, does Mr. Waterman refer to sawed square base ties or pole ties?

MR. WATERMAN: Any kind of tie.

MR. CARD: Our experience in piling beech pole ties is that there has been a large percentage of them that dry so rapidly that they open right up almost in two pieces. We find the beech worse than any other wood that we get outside of the ash.

THE PRESIDENT: About a month ago I was speaking to a gentleman in the East that has had considerable experience in the piling of the beech that they get in the East, and he told me that stacking the ordinary 7 by 1 or 8 by 1 they experience considerable loss due to the tie checking, and that in taking this matter up with the practical men in the woods geeting out beech who have had a number of years experience with it, they advised him to stack the ties with a two-inch strip, recognizing the fact that it would take longer to season but, on the other hand, would eliminate the checking. I would like to ask Mr. Sterling his experience with handling this beech that comes from the East.

MR. STERLING: Mr. President, of course, conditions are somewhat different in Pennsylvania than where Mr. Rex and the other gentlemen are located, and with beech and other hard woods, we have practically no trouble with checking. We get beech ties at all seasons of the year and pile them by the German 1 by 7 method, holding them six months to a year for seasoning. Our beech switch timbers which are sawed and on which, of course, the sap has been largely eliminated, develop deep, long, surface checks, and "S" irons are used to keep them from opening too wide. The 1 by 7 tie piles are in blocks of thirty-six piles, six each way, with a four foot alley between the blocks, and a two-foot alley between every two piles, so that one end of every pile is exposed to the air. This gives a uniform seasoning, and in eight to ten months, as a rule, the ties are in good shape to treat.

THE PRESIDENT: Any further discussion?

MR. HAGEBOECK: I would like to hear some one tell us regarding their experience in seasoning Douglas fir. Our experience with it is that if you season it more than one summer's seasoning that the timbers check so bad we can't use them.

THE PRESIDENT: Any further discussion?

MR. LARKIN: There is a question I would like to bring before you at this time, not in relation to seasoning timber in the yard, but right along the line of Mr. Waterman's paper, namely, the question of piling timber. Now, as applied to paving stock we have considerable trouble. In the first place the commercial plant has to carry more or less paving stock on hand, and here we find that a satisfactory method of piling this material is a very important factor to any operator if he expects to successfully fill his specifications and satisfy his customers. In all the Northern timbers the question of piling is a riddle, and we find that we are sure to lose a very large per cent no matter how we pile. In connection with tamarack the outside sticks are always a total loss, as in fact are all the inside sticks that become thoroughly dried out. We have found so far that the best method is to pile them just as close together as possible so as to retain the moisture in the timber and prevent them from cracking and checking; otherwise if they are allowed to season for any length of time, no matter how they are piled, there will be a check running down through the middle of the stick that will make it absolutely useless and thoroughly unreliable for paving blocks.

In the case of the Norway pine, the same is true, but to a less degree than in tamarack. With the Southern pine we find that this material can be stored and piled in large quantities and allowed to season and dry to a very considerable extent and yet not lose an appreciable amount when finally cut into paving blocks. We pile the Southern pine in any evenly supported way that will allow a free circulation of air throughout the pile.

If there are any suggestions along these lines that would explain any method whereby the Northern timber when used for paving blocks can be carried on hand and piled in the storage yard and yet not deteriorate to such a large extent as it seems bound to do, I would like to hear them.

THE PRESIDENT: Has anyone any suggestions to offer on what Mr. Larkin presented?

I might recite an interesting experience that we had at our northern plant with the checking of tamarack. We had quite a little tamarack checked badly; as you say, the sticks on the outside of the pile were nearly always a total loss. We had a reservoir of water for fire protection, and we took a lot of this checked tamarack and put it in this reservoir and kept it in there about ten days or two weeks. The checks all closed up. A peculiar thing developed upon treating that tamarack in that the checks did not open again. Now, there is a question as to whether this timber is just as valuable as it was before. That I am not prepared to answer, but I do know that the checks closed and that they didn't open up again after treatment.

The subject of seasoning paving material is a mighty important one to those who handle any amount of it. Personally, I don't believe that it is wise to season timber for paving, notwithstanding the fact that we know that it is best to season timber as a general proposition before treatment. My reason is this: One of the greatest troubles we have with the creosoted paving block is the absorption of water and the expansion of the block in the roadway. Now, a thoroughly season stick which has the moisture content below the fiber saturation point has naturally shrunk to a minimum size. Upon treating in small sections, as paving blocks, running from three to four inches deep and generally three to four inches wide and six to ten inches long, the oil enters the cell structure and does not enter the fiber, and consequently does not expand the timber to its normal size again. The oil does not act the same as water, so that you put in the roadway a block that has been thoroughly seasoned, shrunk to the minimum size, and yet its cell structure is filled with oil.

Now, we have conducted a great many experiments on the per centage of absorption and its relation to expansion, and we have found that you can get enough absorption in the outer fiber to expand the block. Now, when you consider a street, say fifty feet wide, for example, and the average length of the block, say, is six inches—that would be one hundred blocks across the street; if each one of these blocks only expands one thirty-second of an inch, there are one hundred thirty-seconds or practically three inches across the street. It has got to go some place—taking up the expansion joints on the side of the street, or the joints between the blocks, or it comes up in the air.

The important feature of treating the stock after it has been cut into blocks is that all the timber in the retort has the same degree of seasoning; you are dealing with a small section and you can get just as good penetration on that small section taking the timber green as you can taking it thoroughly seasoned. I think all the operating men will agree with me on that. You have only got four inches and you can get an end penetration. If you have green timber and seasoned timber in your retort naturally the oil is all going into the seasoned timber, and there is a lack of uniformity in the treatment. So, I say, it is important that all the timber should have the same degree of seasoning. It is generally preferable to have all the timber green and not seasoned, due to the fiber absorption and the consequent expansion.

I don't like to do all the talking, but I have to bring out the points in order to liven up the discussion. There is one point that has not been touched upon that I would like to bring out. I think the commercial plants probably have more experience on this line than the railroad plants. I would like to ask, is it always practical and economical to sort ties in No. 1s and No. 2s a half dozen different kinds of wood as they sometimes come loaded in cars in order to stack them for seasoning? If you don't sort them in order to stack them, is it practical in tearing down your piles to sort them before treatment? I think the last you might say is practical. I would like to find what you think about the first question.

MR. WATERMAN: Mr. President, if you will let me answer that—I don't believe it is practical when you unload from the cars to sort them in classes A, B, and C, we will say, but I think it is practical, if you have plenty of trams, to sort them when you tear down the pile.

THE PRESIDENT: I understand, Mr. Waterman, there is a paper touching on that subject, so we will probably have it brought out more in detail.

Is there any further discussion on this question? If there is no further discussion we will take up Mr. Goltra's paper on the feasibility of grouping timbers for treatment.

MR. GOLTRA: Frankly, little is to be expected from the author of this paper. He is far from a specialist in wood preservation. He is no entomologist nor botanist nor chemist. He confesses to know the end of the tree the root grows on, but little more. His purpose in writing this paper is to invite discussion on a subject in which he is deeply interested in the hope that he will learn the best and most economical method of treating woods to make them durable. He desires to add his mite of experience and observation to the general fund with regard to the grouping of woods for treatment and trusts that this imperfect essay will be helpful in solving a complex and troublesome problem.

Mr. Goltra then read his paper as follows:

ON THE FEASIBILITY OF GROUPING TIMBERS FOR TREATMENT.

It is held by some engineers that in order to secure the best results from treatment, by any process, that it is necessary to separate ties into groups or classes before placing them in the retorts, so that each tie will receive, as nearly as possible, the same quantity of creosote oil, consequently result in a more uniform penetration and absorption, than would otherwise be obtained if the ties were not separated.

There are a good many factors entering into the problem and to give due consideration to any or all of them would require the separation of the ties in a good many groups. To do this necessarily involves labor and expense and unless the advantage due to greater uniformity of treatment more than offsets the expenditure of time and money to separate the ties into groups, it would be unprofitable to have a system of grouping.

By "uniform treatment" it is generally understood to mean that each tie or cubic foot of timber in any charge shall contain, after treatment, about the same *quantity* of creosote oil. Some specifications for treating limits the quantity of creosote oil at so many gallons per tie, or so many pounds per cubic foot of timber, and in order to leave as nearly as possible the same quantity of oil in each tie, or cubic foot of timber, resort is made to grouping of the ties or timber for treatment. Whenever the quantity of oil or preservative is not limited and the material is treated to *refusal,* grouping of ties and timbers is not so essential, because when the material has absorbed *all* the preservative that can be put into it, it cannot imbibe any more. But whenever the quantity of oil is limited in the specifications the operation usually ceases before the material is completely treated and the variation in quantity of oil in each tie or cubic foot of timber is sometimes very large. To cite an example: Last year the writer conducted a test at a certain treating plant and weighed 1,020 ties separately, before and after treatment. It was found that the quantity of creosote oil left in each tie ranged from two (2) pounds to sixty (60) pounds. Fifty-two per cent of the ties had less than 21¾ pounds or 2½ gallons per tie; 48 per cent had more than these quantities. The average was 21.72 pounds or nearly 2½ gallons per tie, which was the quantity of oil that the contractors were required to put in the ties under the terms of their contract.

Inasmuch as no two ties or two pieces of lumber are exactly alike in respect to moisture content, wood structure, proportion of heart wood and sap wood, and in many other respects, it is quite impossible to attain uniform treatment as generally understood, by grouping of the ties and timbers, and the variation is found to be considerable, regardless whether the ties or timbers are grouped or not, for treatment.

The main factors that enter into the problem may be stated as follows:

(1) Moisture Content or Degree of Seasoning.

(2) Physical Structure of Wood in relation to its Penetrability by Preservatives.

(3) Percentage of Heart Wood and Sap Wood.

These are some of the main factors entering into the problem of grouping or separating the woods for treatment. Mention might be made of several others of lesser importance. Let us consider the main factors only.

(1) Moisture Content or Degree of Seasoning, is perhaps the most important factor under consideration. It is a well known fact that wood must be dry before it can be treated, as green wood resists the entrance of the preservative. Therefore upon the extent of dryness of the wood depends in a great measure the quantity of preservative that will be absorbed.

The green, unseasoned timber of *hardwoods* contains on the average water to the extent of about 42 per cent of its total weight; that of the *softwood,* about 52 per cent, and that of *pine,* about 57 per cent. Hence, green wood in general may be said to contain water to the extent, in round numbers, of about half of its weight, but the actual quantity varies with the kind of tree, season of the year, part of the tree, soil and locality, etc. It is never pure water, but here, too, the kind and quantity of sap substance it contains varies also according to the tree, season, soil, etc. This water, contained throughout the tissues and in the intercellular spaces, begins to diminish in quantity by evaporation into the air after the tree is felled, and this evaporation goes on, at a gradual, diminishing rate, until a condition is reached when there is more or less equilibrium between the tension of the atmosphere and power of evaporating the water still contained in the wood. When this condition is attained the wood is said to be ***seasoned*** or ***air-dried,*** but it still contains a considerable quantity of water, varying according to the nature of the wooded tissue and other substances within the wood and their power of retaining water. After the log is manufactured into ties or lumber it loses its moisture quite rapidly at first. From experiments made with beech ties which were cut immediately after the trees were felled, it was found that they contained an average of 45 per cent of their weight of moisture. They were then placed on supports, under shelter, to season. At the end of five months' seasoning (from May to October) the ties were weighed and it was found that they still contained 21 per cent of moisture. It was also found that the wood seasoned very slowly after the first six months, and that after six years of seasoning, under shelter, the beech wood still contained from 10 to 12 per cent of moisture. From the point of view of practicable seasoning of ties, it is scarcely possible, without kiln drying, to lower the moisture much below 20 per cent. The various kinds of woods season at various rates. Some woods dry more slowly than others. Again, some woods contain more moisture at the beginning, so that after air-seasoning for several months the moisture content in the various kinds of woods is considerable and not definitely known and on this account it is difficult to say when the preservation process can best be undertaken. This refers to heart wood, not to sap wood, which loses its water very rapidly.

On some roads it is the practice of shipping ties to a central plant for treatment. These ties are in all stages of seasoning. Some with one month's seasoning, some two, some three and upwards.

The writer has seen contracts made between railroad companies and treating companies that required the ties to be shipped in the "order of their cutting," so that all of the ties in any car would be equally seasoned. Anyone who has practical experience knows very well that it is impossible to deliver ties at the treating plant in the order of their cutting. They are manufactured at all times during the year along the railroad lines or along the rivers and transported in various ways, by rail, by barges and rafts. Cross ties are not made expressly for any railroad, but are bought on the market. Some ties may have been manufactured for several months before the producer can find a market for them and there are conditions when these ties which are seasoned have to be loaded and shipped with ties that were manufactured several months later. Furthermore, the shippers have to secure cars and barges to transport the ties and they cannot control the conditions. It is not always possible to separate the ties into groups according to their different degree of seasoning, as they are loaded on cars or barges, as it is absolutely necessary to fill them to their full capacity, and ties of different degree of seasoning must necessarily be loaded together. For these and other reasons it is manifestly impossible to separate the ties into groups according to their degree of seasoning, as they are loaded into cars; therefore it is impossible to ship them to the plant in the order of their cutting. The writer has observed that when ties reach the treating plant they are unloaded and piled together regardless of their degree of seasoning. It is a common practice to consider all ties in any car as being of equal dryness. This is not correct in all cases, as there may be some ties that were cut one month, two months, three months and upwards. It would be useless to attempt to separate the ties according to their different degree of seasoning at the plant, because the men who unload the ties are not competent to determine that, consequently could not separate them into groups intelligently.

The manner of piling ties in the yard also affects the rate of seasoning. Ties that are piled together dry slower than those piled more openly. Again ties on top of the piles dry faster than those in the body of the pile. Some woods dry faster than others, but in going through some yards the writer observed that they are all usually piled in the same manner.

From the foregoing it is evident that ties and timbers placed in the retorts must contain varying amounts of moisture, that is, some are drier than others and the exact amount of moisture contained in each tie is unknown. All we know is that the material has had an average seasoning. Some pieces may be under-seasoned, while others are over-seasoned.

The theory of separating woods according to their moisture content so that they will absorb the proper quantity of preservative is a nice theory, but it does not work out in practice.

(2) Physical Structure of Wood in Relation to Its Penetrability by Preservative Fluid.

The group of physical properties of wood now to be considered and on which the penetrability of fluids is directly dependent are: (1) Anatomical structure. (2) Density, weight and hardness. The proportion of wood fibers forming the framework and of other elementary substances contained in wood varies in different parts of the tree, as well as different kinds of trees and also according to age, soil, locality, etc. No two trees are alike in wood structure. Some woods are more porous than others. For these reasons and many others the wood takes the treatment unequally when exposed to the same retort condition, even if it was possible to bring the wood to a uniform degree of seasoning. No two species of wood have the same anatomical structure. Each one differs from the other in proportion of woody fiber, size, character and arrangement of the wood vessels and wood cells. Some woods take the treatment easier than others. Red oak, for example, takes creosote clear through the heart, while beech under same conditions is very refractory. No doubt this is principally due to the difference in the wood structure of the species. Some engineers have advocated the grouping of various woods according to their degree of absorption, again some have advocated the grouping according to their specific gravity; others would group them according to the density or weight per cubic foot of dry wood, while some say that they should be segregated according to their degree of hardness. To separate woods into so many groups involves a great deal of labor and expense and it is doubtful if the results obtained would justify it. Some experiments have been made to determine the percentage of absorption of various kinds of woods. From the experiments made by Mr. F. J. Angier, for the Chicago, Burlington & Quincy Railroad at Galesburg, Ills., during 1908 and 1909, the woods were divided into three groups, as follows:

Class A. Absorbing less than 22 per cent in volume.

Class B. Absorbing between 23 and 30 per cent.

Class C. Absorbing more than 30 per cent.

Upwards of 20,000 ties were carefully weighed before and after treatment and a special effort made to find out just what each kind of wood would absorb under normal conditions.

The following table shows a summary of these tests made covering a period of nearly two years. The classes were arranged so that nearly an equal number of woods would fall in each class, there being seven different species of woods in Class A, six in Class B, eight in Class C.

CLASS A.

Kind of Wood.	No. Ties Used in the Tests.	Absorption in Volume %.	Number Months Seasoned in Yard.
Oak, Red	3,112	20.9	6 to 15
Oak, Pin	671	19.5	10
Oak, White	731	14.2	7
Hickory	414	18.8	2 to 8
Beech	2,481	21.8	15
Hemlock	1,364	20.7	8 to 15
Tamarack	2,329	17.1	6 to 8
CLASS B.			
Sweet Gum	928	23.0	5 to 9
Chestnut	345	22.6	12
Hard Maple	691	28.3	15
Ash	318	23.0	2 to 6
Sycamore	364	26.6	7
Poplar	1,348	26.8	7 to 9
CLASS C.			
Short Leaf Pine	2,192	36.9	5 to 9
Soft Maple	599	33.1	6
Tupelo Gum	790	30.7	8
White Elm	872	36.6	7 to 15
Red Elm	626	34.9	6 to 9
Cypress, White	662	35.4	7 to 8
Red Birch	775	33.0	6 to 9

The Chicago, Burlington & Quincy Railroad has also made known the results of other experiments, also made by Mr. F. J. Angier, to determine the absorption of the various species of woods treated together under like condition, using the Card Process and an experimental retort. Three or four ties of each kind were treated. All the ties used in this treatment were seasoned at least eight months and carefully selected, so as to be as free as possible from knots and other defects. No steaming or initial vacuum. In each case the solution, consisting of 23 per cent creosote by volume and water containing 5 per cent of zinc-chloride, was introduced at a temperature of 180° F. and a pressure of 150 pounds was maintained for three hours. This was followed by a one-hour vacuum. The results are given in the following table:

Species.	No. Ties Treated.	Wt. per Cu. Ft. Before Treatment.	Gain in Wt. Per Cent.	Absorption per Tie		Net Gain After Vacuum, Per Cent.
				Zn. Chl. Lbs.	Creo. Lbs.	
Cypress	4	27.3	98.01	4.09	16.96	80.0
Cottonwood	4	23.2	88.31	2.11	12.59	68.4
Willow	4	28.6	82.03	2.42	14.43	58.0
Birch	4	38.2	67.93	2.75	16.45	53.0
White Elm	4	34.4	60.50	2.11	12.59	48.5
Poplar	4	27.0	58.74	1.71	10.24	45.2
Soft Maple	4	32.5	50.58	1.69	10.12	44.0
Hemlock	4	31.6	49.46	1.78	10.64	37.6
Short Leaf	4	32.3	44.22	1.47	8.80	27.3
Hard Maple	4	42.0	40.72	1.75	10.46	33.5
Red Gum	3	33.0	36.99	1.45	8.67	29.0
Beech	4	46.0	36.57	1.70	10.18	27.5
Red Oak	3	44.0	35.87	2.12	12.65	32.0
Ash	3	42.3	34.47	1.69	10.12	30.3
Hickory	4	48.4	23.85	1.09	6.55	20.6
Tamarack	4	40.8	20.29	.81	4.83	20.3
White Oak	4	47.0	7.97	.39	2.30	5.98

Mr. Samuel S. Rowe, who was an authority on wood preservation, furnished the American Railway Engineering and Maintenance of Way Association with his opinion regarding the grouping of timbers. He said:

"The writer herewith submits a statement with relation to proper classification of our American Woods with reference to treating.

"The writer has relied upon a long series of tests as to the natural absorptive powers of each kind to take up water when immersed in a normal degree of dryness, believing it would aid in judging of the nature of the timber in practical treating.

"In practice it is found that woods will absorb in the course of the ordinary methods of impregnation under pressure of 100 pounds, while in the solution, about as much as is taken up by immersion in 28 to 30 days, and on this basis the following table is construed:

"Class A: Those that absorb less than 20 per cent in volume.

"Class B: Those absorbing from 20 to 40 per cent; and,

"Class C: Those absorbing over 40 per cent.

"This gives more than 75 per cent in one class (B), making the exceptions hardly worth considering, *and it hardly seems worth while to attempt classification:*

Name.	Location	Wt. Cu. Ft.	Abs. Wt. per cent	A	B	C
Ash (White)	Mich.	37.8	.265		x	
Beech	Ind.	38.7	.214		x	
Cedar (White)	Mont.	20.8	.265		x	
Cherry (Wild)	Ill.	45.4	.170	x		
Cottonwood	Mont.	24.6	.383		x	
Cypress	Tex.	37.2	.246		x	
Elm (Red)	Ill.	33.1	.215		x	
Elm (Rock)	Mich.	46.9	.216		x	
Fir (Douglass)	Mont.	31.7	.212		x	
Fir (Balsam)	N. Mex.	25.4	.227		x	
Gum	Tex.	32.8	.254		x	
Hackberry	Ill.	40.8	.290		x	
Hemlock	Mich.	25.6	.323		x	
Hickory (s. b.)	Mich.	46.8	.200	x or	x	
Linden	Ill.	27.3	.526			x
Maple (Sugar)	Mich.	46.4	.266		x	
Oak (White)	Mo.	46.0	.249		x	
Oak (Black)	Ind.	41.4	.157	x		
Oak (Red)	Ind.	43.5	.169	x		
Oak (Water)	Ind.	46.9	.132	x		
Pine (Lglf.)	Tex.	34.7	.241		x	
Pine (Sht. Leaf)	Tex.	35.2	.249		x	
Pine (So. Yel.)	Tex.	38.2	.231		x	
Pine (Mtn.)	N. Mex.	28.8	.225		x	
Pine (Mtn.)	Colo.	21.2	.299		x	
Pine (Blk. Hills)	S. D.	29.3	.216		x	
Pine (Mich. Wh.)	Mich.	28.2	.494			x
Pine (Pinion)	Colo.	24.8	.324		x	
Pine (Bull)	Mont.	26.5	.220		x	
Pine (Norway)	Mich.	25.6	.238		x	
Pine (Nor. Wh.)		24.3	.278		x	
Pine (White)	N. Mex.	25.3	.225		x	
Pine (White)	Colo.	23.4	.281		x	
Pine (Diseased)	Wyo.	27.8	.402		x	
Pine (Mex., 8 var.)		32.1	.318		x	
Spruce	N. Mex.	31.3	.274		x	
Spruce (Wh.)	Colo.	24.9	.268		x	
Spruce (Wh.)	Mont.	20.8	.250		x	
Spruce (Red)	Colo.	28.7	.261		x	
Spruce (Red)	N. Mex.	33.2	.164	x		
Sycamore	Ill.	41.0	.366		x	
Tamarack	Mont.	32.9	.228		x	

Class A—20 per cent or less.
Class B—20 per cent to 40 per cent.
Class C—Over 40 per cent.

The condition of the climate and other causes and conditions may vary as well as differences in the same woods in different locations, so that it will be difficult to cover all cases. I have never believed in guessing or jumping at conclusions when it is possible to get something that will aid to guide, and I am sure that this method, no matter how many classes are desired, will be an aid."

From the three experiments given above it is apparent that there is a good deal of variation in the percentage of absorption among the different kinds of woods and even among the same species.

In the first set of experiments made by Mr. Angier, given above, he found red oak absorbed in volume 20.9 per cent, while in the second experiment he found that it absorbed 32 per cent; and the beech in the first experiment absorbed 21.8 per cent, while in the second experiment 27.5 per cent. In Mr. Rowe's classification he gives the per cent of absorption of red oak as 16.9 per cent and of beech 21.4 per cent.

So much depends upon the character and condition of the wood and the pressure, temperature and character of the preservative, that it is very difficult to determine, with any degree of accuracy, the relative percentage of absorption of the various kinds of woods. It is almost impossible to arrive at the same results when woods are treated under different conditions, so that no rule can be safely established regarding the classifying of timbers.

The New York Central Lines requires the separation of woods, accepted for treatment, into five groups, but the grouping was not determined by actual experiments. One of the contracts with the treating company provides that the various woods be separated into groups as follows:

(1) Beech and sycamore.

(2) Gum and elm.

(3) Red, black and water oak.

Various other woods as experience shows can be grouped together.

In another contract made with the same treating company some years later, it provided that the various woods be separated into the following groups:

(1) Beech.

(2) Hickory and sugar maple.

(3) Red, black and water oak.

Various other woods as experience demonstrates can be grouped together.

When the writer was General Tie Agent of the New York Central Lines, he undertook to group the timbers in such a manner as to comply with the specifications contained in these contracts, with the results that the various species were grouped as follows:

GROUP NO. 1.

Red Oak.
Pin Oak or Swamp Spanish Oak.
Black or Yellow Oak.
Spanish Oak.
Water Oak or Jack Oak.
Scarlet Oak.
Shingle Oak or Scarlet Oak.
Willow Oak.
Honey Locust or Honey Shucks.

GROUP NO. 2.

Beech.
Sweet Birch or Black Birch.

GROUP NO. 3.

Sugar Maple or Rock Maple.
White Ash.
Bitternut or Swamp Hickory.
Shellbark Hickory.
Mockernut Hickory.
Pignut Hickory.
Hackberry, Sugarberry or Nettle Tree.

GROUP NO. 4.

Silver Maple, Soft Maple or White Maple.
Red Maple, Swamp Maple or Soft Maple.
Sycamore.
Red Birch or River Birch.
White Elm, American Elm or Water Elm.
Cork Elm, Rock Elm or Hickory Elm.
Tupelo, Pepperidge, Sour Gum or Black Gum.

GROUP NO. 5.

Red Gum, Sweet Gum or Liquidambar.

After three years' trial in separating the different species of woods, the writer comes to the same conclusion as Mr. Samuel S. Rowe, that it is hardly worth while to attempt a classification. It involves considerable labor and expense to separate the ties into groups and perhaps just as good results would be obtained, under present method of treatment, if the woods were not separated at all.

The percentage of absorption of the various kinds of woods is only of the many factors that enter into the problem, and no undue consideration should be given to it. Due consideration should be given to *all* factors and it is useless to go into extreme refinements concerning one or two influences and neglect wholly or in part the others, for the deductions will be both incorrect and misleading.

Some engineers think that the groups should be governed by the "specific gravity" of the wood, or "density," or "weight" per cubic foot of dry wood. This rule would apply in general, but there are many exceptions. There are some woods that are light, yet difficult to treat, while there are some that are heavy and easy to treat. Again some engineers would classify or group the timbers, according to their degree of "hardness." Hardness in wood is rather an indefinite term, because the hardness manifests itself differently when such different kinds of instruments are applied to the wood, as the ax, knife, plane, saw, nail, etc., some of which would work parallel to the fibers and others at right angle to them. However, it has been found that it is not always the hardest woods that are most refractory, nor the softest woods always the easiest to treat. As a general rule, perhaps, it is so, but there are several exceptions. For example, red oak is considered a comparatively hard wood, yet it is easy to treat, whereas red gum is a much softer wood, yet more refractory.

In view of the foregoing it is evident that no satisfactory grouping can be made of the various kinds of woods, either according to their absorptive powers or penetrability, or weight per cubic foot, or density and resistance to penetration, or hardness, and in the opinion of the writer it is futile to attempt it.

(3) PER CENT OF HEART WOOD AND SAP WOOD.

The percentage of heart wood and sap wood in timber is another important factor in the problem of grouping timbers for treatment. No two pieces of timber can be found with exactly the same percentage of heart wood and sap wood. The proportion of the heart wood and sap wood in a finished product, depends upon the size of the tree, the part of the tree from which it was obtained and upon the size and shape of the manufactured product. The sap wood is considerably more porous than the heart wood in all kinds of woods, therefore the former takes the treatment much easier than the latter. The depth of the preservative absorbed depends upon the resistance of the wood to injection, consequently it requires less time and less pressure to treat the sap wood than it does the heart wood. In treating woods with varying percentages of heart wood and sap wood in the same cylinder, the sap wood naturally absorbs more oil than the heart wood, and if only a limited amount of oil is injected in the material, it is probable that the heart wood might not receive any treatment, or at any rate, only partially, as the limited amount of oil would all be absorbed by the sap wood. However, if the material is treated to a refusal the heart wood would absorb all that is possible to inject into it, after the sap wood has imbibed all that it can contain.

It has been suggested by some engineers that the ties and timbers be grouped as follows:

Heart, less than 20 per cent.
Intermediate, more than 20 per cent and less than 50 per cent.
Sap, more than 50 per cent.

It must be apparent to anyone that is acquainted with the conditions at treating plants that it is impractical to group ties or timbers in such a manner. The material is usually loaded on tram buggies, by day laborers, who possess very little scientific knowledge of this character and who cannot be expected to examine every piece of timber as they load it on the trams to determine the percentage of heart wood and sap wood, so as to know to which of the three classes it belongs.

We have considered the three main factors that enter into the problem of grouping, but there are several others that might be mentioned, such as size and shape of ties and timbers, whether sawed or hewed, method or process of treatment, etc., but we will not attempt to discuss them in this paper.

In conclusion, it might seem at first that a suitable grouping could be predicated upon the moisture content or degree of seasoning, or upon the known structural characteristic of the various species, or upon the relative percentage of heart wood and sap wood, but it must be apparent from the foregoing that it sounds well in theory, but cannot be worked out in practice. The opinions regarding the proper grouping of ties for treatment are so contradictory and reliable data are so meager and there are so many factors that enter into the problem, it is deemed inadvisable, in the opinion of the writer, to attempt it. *Some method or process can perhaps be devised whereby it would be unnecessary to separate the ties or timbers into so many groups for treatment.* It is easy enough to discuss the probable behavior of certain species from a purely theoretical point of view, taking into consideration the physiological structure of the different timbers, their organic cell contents, their percentage of heart wood and sap wood, etc., but experience has shown very emphatically that the controlling factors which influence the absorption of different preservatives by different processes, are so complex that theoretical deductions are erroneous more often than correct.

SECRETARY ANGIER: Mr. President, there is one thing in Mr. Goltra's paper where he referred to a test made by me that I want to explain. He says that in the first experiment red oak absorbed 20.9 per cent in volume, while in the second experiment it absorbed 32 per cent. I want all to understand just how these tests were made. In the first instance 3112 ties were tested and they consisted of the red oak family. That included the black oak, water oak, willow oak, and a miscellaneous lot of others, and they were treated just as we got them at the plant seasoned from six to fifteen months. In the second test there were only three ties tested, and they were carefully selected; they were not only seasoned, but they were free from defects, such as knots, etc. This would account, I think, for the excessive absorption in the second test.

MR. STERLING: For information, I would like to ask Mr. Angier where he got 345 chestnut ties to take 32.6 of their volume. I would like to know how he got hold of any chestnut ties that would take any oil like that.

SECRETARY ANGIER: These were treated with the mixture process, zinc and creosote, and in every case the pressure was kept on until they would not absorb any more. In other words, they were treated to refusal.

MR. WEISS: This question of grouping timbers for treatment is one in which I am personally very much interested, as I unfortunately happen to be charged at the present time with securing additional information on how the various classes of ties ought to be grouped before running them into treating cylinders. I believe that it would be manifestly a step in the wrong direction; in fact, I am convinced thoroughly of it if we attempt to argue that the separation of ties according to various classes for treatment should not be undertaken. In don't believe that there are any men here present who would attempt, for example, to put a heart Douglas fir with a sap loblolly pine tie and treat both at the same time. You all know that the results you would secure from practice of that kind would not justify your expense in treating the material at all.

The separation of ties, in my opinion, is necessary; but we can't let all these thousand and one little factors which enter into the problem complicate it to such an extent that it becomes a hopeless task. We have been making a few tests at the laboratory in trying to see if there are not some fundamental laws whereby we can arrive at the proper grouping of species for treatment. While this work has been going on for only about a month and while I hesitate to give you any final conclusion, nevertheless, we have found out a few things which I think will throw some valuable light on this subject.

You all know full well that if you take a pine block, such as loblolly pine or shortleaf pine, and put it in a cylinder and treat it with creosote oil, that if that block is of comparatively rapid growth you will get a series of bands, that is, you will get a streak of dark wood and next to it a streak of wood comparatively light in color. On the other hand, if you have a block which is not of very rapid growth and split it open you will find that the color is more uniform and the distribution of the oil seems to be better. We tried to find out whether or not the dark band actually contained more creosote than the light band. The dark band is summer wood. It is the wood which is formed in the latter part of the growing season of the tree. We took some pieces of pine and separated this dark band from the light band. We found the specific gravity of the summer wood in pines like longleaf and loblolly was about three times that of the spring wood. In other words, the specific gravity of the spring wood was approximately .3 while the specific gravity of the summer wood was approximately .9; in fact, some of the pieces just about sunk in water. When analyzed after treatment it was found that in spite of the fact that this summer wood was three times as dense, three times as heavy as the spring wood, nevertheless, it took up twice as much creosote; there was twice the creosote in this summer wood that there was in the spring wood. Naturally, one would expect the lighter the wood, the more porous it is and the more creosote it would contain, but in this case that was not true.

So, pursuing those investigations a little further, we had some tests made on the redwood from California, the Sequoia, and, much to our surprise, we found the reverse of our former observations was true. We found the light spring wood took up creosote in larger quantities than the dense summer wood. The reason was pretty hard to discover, and we don't claim—I want to impress this very strongly—that we have definitely decided just what the reason is, but it looks as though the reason for this unequal distribution of the creosote in the woods that I have mentioned is due to the character of the resinous condition of the woods. As all of you gentlemen know, these coniferous trees, such as pines, spruces and hemlocks, have long resinous canals through them. The more resin canals in the wood, the easier the distribution of creosote will be through the wood. For example, in the hemlock and the spruce, both of which species are comparatively difficult to satisfactorily impregnate, this resinous system is imperfect. The resinous tubes or little canals are imperfect and filled up with various cross walls, etc. But you take woods like the loblolly pine and these canals run clear through them, making it comparatively easy for the oil to get into the species of this nature.

If the deductions which have been made so far can be proved by further tests—and we will make further tests to try and prove them—it looks as though we have gotten a fundamental law. In other words, in the treatment of coniferous woods, the absorption of the preservative will be in direct proportion to the number, distribution and character of these resinous canals. If this is so, I believe that a whole lot of mystery relating to erratic results in the treatment of timber will be solved.

Naturally, we have to consider such questions as amount of moisture in the wood, the amount of sapwood and heartwood. These are problems, however, which can be very easily disposed of if we can only get hold of some fundamental law which will hold.

Now, my remarks in regard to the penetrance of these pines refers only to creosote. They do not refer to any treatments with crude oils or any of the paraffine oils. While we have made but a few tests of such materials, the results so far indicate that the law will not hold in such treatments, because it appears that the creosote has a solvent action on the resin contained in the wood; in other words, it tends to dissolve out the resin so that the creosote can enter more readily.

In treating, for example, loblolly pine with creosote oil, as you all know, it is a question of keeping the oil out rather than getting the oil in. You can take a stick of loblolly pine and put twenty or thirty pounds of oil to the cubic foot very readily; in fact, we have done it with specimens two feet long in about eight or ten minutes. With the same kind of wood, using the same pressure but with a paraffine oil, our results so far indicate that it is going to take considerably longer. The reason we do not know, but it may be that these oils do not exert the same solvent power upon the resin in the wood.

My remarks also only refer to coniferous woods, such as pines, spruces and hemlocks. When we talk about the hardwoods—the oaks, the gums and the hickories—we are up against a different proposition altogether.

I would like to emphasize this: I think that the grouping of timber is essential to proper work. What is desired, is an even distribution of the preservative through the wood. If we are not going to have any basis of classification at all, we are going to secure all sorts of erratic results in treatment. Of course, it logically follows that we can't carry this division of wood to such a fine theoretical extreme that the results we get are not warranted by the cost to which we are put.

THE PRESIDENT: Any further discussion?

MR. GOLTRA: We do not wish it understood that we advocate treating loblolly pine and Douglas fir ties together, whenever they can be treated separately just as well as not. Naturally, these woods would be treated separately because they come from entirely different localities and would, as a rule, be separated when they arrive at the plant. And if the woods are naturally separated we would suggest treating each kind of wood separately. Mr. Weiss has stated that his remarks refer chiefly to the pine and fir ties and not to the hardwood ties. On the contrary, my remarks apply to the hardwoods, such as oaks, beech, maple, sycamore, elm, hickories, etc., which are accepted for creosoting by the New York Central Lines. These are the timbers which I mention as unnecessary to separate into groups for treatment, so long as they are treated by the present method in vogue on the New York Central Lines. We all know there is a great variation in the degree of absorption of the different species. The degree of absorption of the different kinds of wood is difficult to determine, as it depends upon the degree of seasoning; percentage of sapwood and heartwood which they contain; upon the nature and density of the wood; method of injection and of the temperature of the wood and of the creosote oil or liquid that may be used for treatment. In fact, upon the conduct of diverse phases of the operation, such as steaming, vacuum, pressure, temperature and duration of treatment. Should a dozen independent experiments be made to determine the degree of absorption of the various kinds of woods, no two would be alike and it would be useless to make any arbitrary rule to classify the different kinds of woods according to their degree of absorption. We must also bear in mind that there are many other factors that enter into the problem of grouping woods for treatment. For instance, the percentage of sapwood and heartwood, degree of seasoning and method or process of treatment. All of these factors must be given due consideration and it is useless to base any conclusions on simply one or two of these factors. The trouble is, we have been trying to fit the natural condition of things to some particular method or process, whereas we should be doing the contrary, by trying to fit the treatment to the natural conditions. We can make a shoe fit the foot, but we cannot make the foot fit the shoe. Mr. Logan, in his admirable paper on "General Review of Timber Treating in This Country with Special Reference to the Causes That Have and Are Retarding Its More Universal Adoption," very truthfully states that our proceedings contain little calculated to enlighten the user of forest products along practical lines in wood preservation, and to convince people of the merits of legitimate work by proper methods. We hold too tenaciously to "quack methods and bogus processes of treatment," which ought to be denounced by this Association.

We believe that some method or process of treatment can be devised whereby it would be unnecessary to separate the ties into so many groups for treatment. One idea which occurs to me is to treat the ties "to refusal" with whatever preservative might be selected. If creosote oil is used exclusively it would no doubt be very expensive as the ties would absorb perhaps forty-five to fifty-five pounds of oil apiece, which as a rule is the quantity injected in ties in France and Germany. The oil is considerably cheaper in those countries than in our country. We do not think it would be prudent to put so much oil in a tie treated in this country, because it would make them last much longer than the mechanical life of the ties. In Europe each and every tie is heavily plated. Besides, they use screw spikes and all of the ties are mortised for plates and holes are bored for screw spikes before they are treated. There is practically no mechanical wear on ties used in Europe, whereas on the American Railways a great many of the ties are destroyed within ten or twelve years. Should ties be treated to last longer than the mechanical wear, it would simply be a waste of money. We believe that a cheaper antiseptic than creosote oil would be more economical, and if chloride of zinc will make the ties last as long as the mechanical wear, we believe it would be economical to use it. Some people claim that it leaches out and that ties cannot be made to last longer than ten or twelve years. Perhaps that is true, but it is claimed that a solution of creosote oil and chloride of zinc will not leach out and such a solution would cost much less than creosote oil alone. In fact, the cost of the preservative would depend upon the quantity of creosote oil and chloride of zinc that would be required per tie. The ties can then be treated to a refusal and all of the cells and voids completely filled with the antiseptic. The sapwood would take up all of the preservative it could contain and then the heartwood would take up all that it could carry, according to the pressure, duration and method of treatment, and that would make it unnecessary to separate the woods into groups according to their degree of absorption, degree of seasoning or other factors which enter into the problem of separating woods for treatment.

The degree of seasoning of wood is an important factor. As stated in the paper we have just read, when trees are felled the logs contain about fifty per cent of its weight in moisture. Thus, a 6x8-inch, 8-foot tie, which is equivalent to twenty gallons in volume, would contain about ten gallons of moisture. Suppose the moisture is reduced by air seasoning to twenty per cent of its volume, six gallons of water is evaporated. Now, some people claim they can refill these empty cells and pores with two and one-half gallons of creosote oil. It is manifestly impossible. But if a combination of chloride of zinc and creosote oil is used and the ties treated to refusal, or until these empty cells and pores are completely filled, the ties would then be treated as thoroughly as is possible to treat them. We believe that it is better to treat the ties and fill the cells with a weak solution of chloride of zinc, than not to fill them at all. We desire it distinctly understood that we are not advocating or favoring any patent process, nor have we any interest in the method we suggested, but simply make this suggestion with a view of improving the methods of treatment of ties in this country.

THE PRESIDENT: I was interested in what Mr. Weiss had to say with reference to wide and close rings; the difference in the amount of preservative a wide and a close ring pine would absorb. I might say, Mr. Weiss, we have found by practical experience in treating paving blocks that whenever you have a wide ringed block, say a block running six rings to the inch, in with a charge containing blocks with average rings running over eight and nine, that in every case where you cut the wide ringed blocks you will find them white inside; practically no oil in them. When we first made this discovery, we thought something was wrong, and we began to experiment. We put a certain number of wide ringed blocks in with the charge of dense ringed blocks and in every case the result has been the same. If you picked the wide ringed blocks out of the charge afterwards, one or a dozen, you will find pretty nearly in every case the interior of the block was white. We have found that city inspectors on the streets or at the plant would take the blocks and cut them in two and would say it has no oil in it and it is a wide ring block. If this block hasn't oil in it how can you expect the other blocks to have? When you would get a close ringed block, apparently a denser timber, you would find in every case it was full of oil.

Going back to the general proposition of the feasibility of grouping timbers, Mr. Goltra in his paper says, "The consolidation of considerable labor and expense is required to separate ties into groups, and perhaps just as good results would be obtained under present methods as to treatment, if the woods were not separated at all." That statement, gentlemen, undermines what has up to date been practically an axiom of wood preservation, and we ought to have it thoroughly discussed. It is important that we hear from the practical men who have had charge of timber preserving plants for a number of years. It brings out an entirely new thought. We have always advocated the necessity of separating timbers into groups. Now, we hear an advocate of non-separation which is entirely in opposition to anything we have ever thought of along this line. Our whole development has been toward the separation of timbers into groups. I believe this matter of sufficient importance for every man here who has had any experience, to give us an expression of that experience at this time. I would like to hear from Mr. Sterling.

MR. STERLING: Mr. President, I think it would have been better for some of these other gentlemen to discuss this matter first because our experience, naturally, is limited in the point of time. We started out with the plan which you have just mentioned, and as far as possible, have followed it, learning as we went along, into just what groups to throw the different species. The time soon came, however, when our yards were congested and we had to do many things we did not want to do. In other words, for a time it was impossible to group as we thought we should group, and the result was that some of our charges for several months were very badly mixed up. The results were just what you would expect—the partly seasoned ties and the green ties got very little oil and the seasoned ties took the bulk of it. The practical grouping as developed up to the present time, is to throw into one class, which is called the miscellaneous hardwoods, beech, birch, maple, and odds and ends such as sycamore; red oak as far as possible has been kept separate, but that, too, under stress of congestion has often been treated with these other hardwoods I have just mentioned. Heart pine, sap pine and gum also constitute independent groups, and are treated separately.

When ties have been in the yard long enough to season—eight or ten months, in our climate—we get very good results with the above mixture if hardwoods; but our conclusions now are that we should go a little farther and separate out the beech from the other hardwoods. Beech, as you all know, has rather variable characteristics, and since many ties have more or less red heart, it does not treat readily and probably should not be thrown with red oak or birch and maple. Sap pines, of course, have been kept separate; but we are now using what is a rather new classification in the East, namely, what is called "sap longleaf" in lieu of a better term; this simply covers longleaf ties which have too much sap to be accepted under our heart specifications for use untreated. In treating these sap longleafs it is advisable to separate them from other saps, which really brings us back to the old basis of heart wood and sap.

THE PRESIDENT: Gentlemen, we have with us a man who I believe is familiar with the practice in England and possibly with the practice in Germany. I would like to introduce Mr. Workman of Belfast.

MR. WORKMAN: The problem of correctly grouping timber for treatment is settled in England by natural causes. Almost all our lumber is imported, and only a comparatively few varieties of timber are employed for the purposes where large quantities are used, and where, therefore, grouping would be of importance.

These varieties naturally come in from the various ports of shipment to the respective timber preservers, already sorted, as far as is usually necessary.

A considerable amount of pitch pine is used for piling spruce for some classes of constructional work and mostly red pine for sleepers. If these did not come in and be kept separate in the natural course of events, they would undoubtedly be grouped before treatment, as in doing a mixed charge of such lumber, where the spruce and pitch pine were getting their ten pounds of oil per cubic foot, which is about the average specification, the red pine would be getting considerably more.

Practically all the timber is treated after being properly seasoned, but where certain ship loads have to be done in a hurry, and therefore greener than usual, little difficulty is presented, as the various lots will be fairly uniform and on account of the small cylinders in use in England, compared to those I have seen in the United States, they will not readily get mixed with the seasoned material in stock.

More careful grouping than results from these circumstances would in my opinion not pay, as the price of oil is comparatively low, from four to five cents per gallons (ten pounds).

THE PRESIDENT: I was glad to know the amount of oil use for treating. I would like to ask Mr. Baker as to his experience on this question.

MR. BAKER: Mr. Chairman, I have had no experience except with pine and we have always had them come to the plant either hewed or sawed in carload lots; and we have never had any experience in separating the ties in the yard. There was no necessity for making any effort to get the different groups together—they always came in in such shape that we could treat them as they came. The only thing that interested me was keeping the sawed and hewed ties separate. I don't think I can say anything that would interest anybody on this subject.

THE PRESIDENT: It is getting along towards the hour of noon and I don't believe that we will close this subject with the morning session. I realize that we have got a great many papers and that we are going to have a might busy session this afternoon and tomorrow. We have had seven papers so far and we have eleven to hear from.

MR. STERLING: There is just one thing that I would like to suggest to be brought up this afternoon. It has not been discussed at any of the meetings I have attended and I now bring it up merely as a matter of information for discussion; it is the matter of dry kilning. I got this idea at the Kirkeeon of the Bavarian Railways, and I have been wondering ever since whether with woods which perhaps decay before we can season them in the case of rush requisitions where there is not time for seasoning, it would be wise to consider the use of the dry kiln in connection with treating plant yards in this country.

MR. GOLTRA: I will try to answer Mr. Sterling. We have looked into the subject pretty thoroughly. We worked up some plans and designs of dry kilns, but found that the cost of the kilns and appliances as well as the cost of operation, was such to preclude the use of same. Our idea was to construct a kiln consisting of sixteen cylinders of the same size as the impregnating cylinders. The ties were to be steamed and then hot-air blast introduced to dry them thoroughly, the steaming and hot air operation lasting about four days. The ties were then to be drawn out of the cylinder and placed in the impregnating retort while still warm. We found that the cost of the kiln and appliances was upwards of $40,000. Boiler capacity necessary to supply steam and operate the hot air blast would cost in the neighborhood of $20,000 but the cost of fuel is rather indefinite, but ran up into pretty high figures. We estimate that the cost of operating the kiln, including all labor, depreciation and interest on the investment, in the neighborhood of ten cents per tie. This estimate is made on the basis of treating 900,000 ties per annum. We concluded that the steaming and drying could be done more economically in the treating retorts, instead of separate kilns.

NOTE:—Since the above remarks were made, Mr. Goltra claims to have devised a method of kiln-drying ties whereby the expense for fuel is only one and one-quarter cents per tie. He further claims that the total cost of building a dry-kiln with a capacity of 1,000,000 ties per annum, is about $60,000.—Secretary.

MR. CARD: There was something said with reference to the necessity of putting slats between sawed ties. There seems to be a good deal of difference of opinion in regard to that. It seems there are about as many who think it is not necessary as there are who think it is necessary. Possibly there is some one here today who could throw some additional light on that subject.

THE PRESIDENT: Mr. Angier, you might give us your experience.

SECRETARY ANGIER: Mr. President, I read a paper on this same subject last year and Mr. Goltra has quoted me in his paper. I think I have said enough about it. I do not believe I can add anything.

THE PRESIDENT: Well, I would like to ask you whether or not you consider it necessary to group the hard woods?

SECRETARY ANGIER: I certainly do think it is necessary. I do not think that an oak tie can be treated with a pine tie, and I absolutely believe that we should have a separation between the different species.

MR. ALLERTON: I was just going to remark that I have had a good deal of experience in treating sawed ties and timbers and I have found that the best practice was to separate them by strips and also separate them horizontally by shims, especially where ties were subjected to preliminary steaming. There is no doubt but what it is the proper thing in that respect.

MR. GOLTRA: Mr. Allerton has referred to preliminary steaming of ties. We favor that process which steams the ties before they are impregnated, for several reasons. In the first place, if the ties are steamed, it shortens the time that they have to air season so that instead of keeping the ties in the yard from eight months to one year to air season, the time can perhaps be reduced by one-half. It is true it costs something to steam the ties in the retort and it lengthens the time of treatment, but if a large saving in reduction of stock of ties on hand can be effected thereby, it might be economical to complete the drying in this manner. Suppose a railroad company has to maintain a stock of 900,000 ties for nine months, so that they will be in proper shape for treatment, and that stock can be reduced to 450,000 ties by steaming them would not that alone more than compensate the expense for lengthening the time of treatment? Secondly, if the stock can be reduced materially a large saving would be effected by diminishing the deterioration of the ties while they are air seasoning. Mr. Rollins pointed out a few moments ago that a great many of the ties split and rot while air seasoning. If we can shorten the time of air seasoning we would in all probability greatly reduce the loss through deterioration. The loss through deterioration is probably larger than some people would imagine. From our experience we find that the average loss through deterioration is about three cents per tie. Third. The steaming of ties puts them in better condition to receive the preservative fluid. Many of the ties when they are sufficiently air seasoned have become hardened on the outside and they resist the entrance of the preservative fluid. By steaming the ties it opens the pores and permits the entrance of the preservative fluid more readily than when they are not steamed and pressure immediately put on them. Consequently we can obtain a much better and deeper penetration. It also completes the drying of such ties as are not fully air seasoned. Perhaps most of you know that the Bethel and Burnett processes—the oldest and two most widely used processes—employ this principle. In the Bethel process creosote oil is used, and in the Burnett process chloride of zinc is used. The method of injecting the preservative into the timbers is, in each case, practically the same. These two processes have long been accepted as standard, both in this country and in Europe, and very little improvement has been made on them. After the ties have been placed in retorts and doors closed, live steam is introduced into the cylinder and a pressure of about 20 pounds per square inch is maintained for several hours. When the steam is at last blown out of the cylinder, the vacuum pumps are at once started and as much of the air and moisture as possible is exhausted from the cylinder and from the wood structure. This process also continues for several hours. Finally, after the completion of the vacuum period the preservative is run into the cylinder at a temperature of 160° F., and the pressure pump started and continued until the desired amount of preservative is forced into the wood. The ties are allowed to drip for a few minutes and finally withdrawn from the retort. The trouble with some plants is their hurry to treat ties. It is not a question with them how well the ties can be treated, but how rapidly and cheaply it can be done. I have heard of a certain treating plant treating 100,000 ties with one retort in one month. I submit to you, gentlemen, that these ties were not properly treated and the treating company simply went through the motions of treating them.

MR. ALLERTON: Mr. President, Mr. Goltra is perfectly well aware that I do not believe in steaming ties or timber at all, and that is probably the reason that he favors it (laughter); but the softening of the tie by using water vapor or steam at a low temperature is an entirely different matter, and that very often in case wood is over-seasoned is a very desirable process, and I am fully in favor of that. But as for steaming at a high temperature and high pressure, I do not believe in it at all for any kind of wood whatever.

MR. GOLTRA: Mr. President, I would say that the pressure should not exceed fifteen pounds per inch, which is equivalent to a temperature of 213 degrees. That is very low. I do not advocate steaming at a high pressure and a corresponding high temperature; but I would limit the steam pressure to fifteen pounds, which would not injure the wood in any manner whatsoever.

THE PRESIDENT: We will carry this discussion over until this afternoon's meeting. This meeting now stands adjourned until one thirty.

(A photograph of those in attendance at the convention was then taken.)

Recess was taken till 1:30 p. m.

WEDNESDAY AFTERNOON SESSION,

January 18, 1911.

The meeting was called to order by the President.

THE PRESIDENT: The discussion of Mr. Goltra's paper, which we discontinued this morning, is again in order. I would like to hear from some of the members in this connection.

MR. BURKHALTER: Mr. President, I would like to offer a few resolutions on that question for the consideration of the Association:

RESOLVED, That in the opinion of this Association the treatment in the same cylinder charge of ties having great dissimiliarity of permeability is not expected to give the best results until the treatment is carried to total refusal; and

RESOLVED, That in the opinion of this Association the time of treatment required to obtain total refusal varies in different species and with different seasoning so much as as to make for serious delay in the case of the ties which have first reached totality waiting in the cylinder for the more refractory to obtain it; and

RESOLVED, That in the opinion of this Association the sorting of timbers before treatment is progress in the right direction.

THE PRESIDENT: You have heard Mr. Burkhalter's resolutions. Is there any discussion?

MR. GOLTRA: I think that these resolutions are a little premature. I do not believe that the Association has had time enough to think over the question and discuss it. I believe that it would be a mistake to adopt any such resolutions as that without a great deal more consideration that has been given to the subject. It might put the Association in a ridiculous position if next year, for instance, it should find that the greater part of my suggestions were correct. It seems to me that it would be well to delay the adoption of any resolutions which are so conclusive until the matter is discussed more fully.

MR. ALLERTON: I move that Burkhalter's resolution be laid on the table.

MR. GOLTRA: I second the motion.

MR. WATERMAN: Mr. President, I would like to know why Mr. Allerton from his standpoint moves that the resolutions be laid on the table. Is he of the opinion that it is unwise to sort ties and treat them by classes? Is he of the opinion that all these years this Association of men treating timber have been working up to the point of classifying timber, that they have made a mistake? I would like to have him talk to the motion. I want to know what he is driving at.

MR. ALLERTON: Mr. President, I think that Mr. Burkhalter's resolutions are worthy of further consideration. We have no committee that we can refer them to at present, and if they are laid on the table they can be brought up at any future time and referred to the proper committee. That was all that I meant by my motion.

MR. BURKHALTER: Of course, I had the idea that while there were some men who were not long in the business, that others, like Mr. Allerton, had thoroughly made up their minds as to which way the treatment of timber was headed, and would be willing to go on record in voting on these resolutions. Of course, there are others who have not been studying this, but I should think that as long as this Association had been in existence for some time that its general idea would be more or less crystallized.

THE PRESIDENT: You have all heard Mr. Allerton's motion, which motion was seconded. Is there any further discussion?

MR. ALLERTON: Mr. President, I think the subject is one that should be referred to a committee, to be reported on before the society as a unit commits itself in any form.

SECRETARY ANGIER: Mr. President, if I am in order I would move an amendment to Mr. Allerton's motion that these resolutions be voted on by the members present.

MR. MEYER: I second the amendment.

MR. LARKIN: Was Mr. Burkhalter's motion seconded?

THE PRESIDENT: I was not aware that Mr. Burkhalter's resolutions were in the form of a motion. As I understood Mr. Burkhalter they were in the form of a resolution. Mr. Allerton's motion was seconded and the amendment was seconded.

MR. WATERMAN: Mr. President, if I may be allowed one word then I will try to be quiet. The best committee, it seems to me, that you can possibly refer this to is the committee of the whole, and we should discuss it and settle it one way or the other.

THE PRESIDENT: Is there any further discussion on Mr. Angier's amendment? Are you ready for the question?

THE MEMBERS: Question, question.

THE PRESIDENT: All those in favor of Mr. Angier's amendment signify it by saying, Aye; those not in favor, No.

Motion carried.

THE PRESIDENT: It would seem as if, the amendment being in the nature of a substitute for the motion, it would be unnecessary to vote on the motion.

MR. CHANUTE: I think if you will have the stenographer read his notes you will find Mr. Burkhalter's motion has not been seconded.

MR. BURKHALTER: My resolutions are in the form of resolutions. It says "resolved" in each case.

MR. CHANUTE: I think Mr. Burkhalter said at the end of his resolutions that he put them in the form of a motion.

MR. BURKHALTER: The resolutions are written in the form of resolutions. A motion has been made by Mr. Angier to handle the case, as I see it.

THE PRESIDENT: We will now take a vote on the original motion of Mr. Allerton.

MR. BURKHALTER: What was the result of this vote on Mr. Angier's amendment?

THE PRESIDENT: The amendment was carried.

MR. BURKHALTER: The amendment was that the resolutions be voted on?

THE PRESIDENT: That was the amendment to Mr. Allerton's motion, that the resolutions be voted on; but it is necessaary to get a vote on the motion. Those in favor of Mr. Allerton's motion signify it by saying, Aye; those not in favor, No.

Motion lost.

THE PRESIDENT: We will now vote on Mr. Burkhalter's resolution, whether it is the sense of this Association to print these resolutions as the voice of the Association. Those in favor of

Mr. Burkhalter's resolutions signify it by saying, Aye; those not in favor, No.

Motion carried.

THE PRESIDENT: We will now go on with the regular program, a paper by Mr. David Allerton on "What Depths of Penetration Are to Be Expected From the Different Amounts of Preservative Usually Specified?"

Mr. Allerton then read his paper, as follows:

"WHAT DEPTHS OF PENETRATION ARE TO BE EXPECTED WITH THE DIFFERENT AMOUNTS OF PRESERVATIVE USUALLY SPECIFIED."

This subject is one upon which a great deal might be written, and probably should be, but as these papers are intended to open up the question and draw out facts and opinions of value, I shall confine myself to a brief exposition of what I have found in my experience, trusting that it will coincide, in a great measure, with that of others; and not be at great variance with any; for I realize that those whose only experience has been with railroad ties often, while correct as to them, have formed different opinions as to penetration of preservatives, to those who have treated all manner of structural timber. It is obvious that the penetration of a given quantity of preservative to the cubic foot must depend to a great measure on the length, breadth and thickness of the piece of timber treated; that is, to the amount of surface; as I have pointed out in a previous article, a pile has the least surface in proportion to its volume; bridge timbers come next, such as caps and stringers, and so on down to planks and boards, where the surface to be treated is very great. It therefore is apparent that as the surface per cubic foot is increased, to get an equal penetration the quantity of preservative must be increased.. But often I find this indisputable fact reversed, and people wanting eighteen pounds per cubic foot put into piling and eight or ten pounds, sometimes less, put into inch boards, and expecting the same penetration. Now again the kind of preservative comes under consideration, and of these I shall only allude to the two most commonly used: zinc chloride and creosote, of the first which is generally used in a solution of from 3 per cent to 5 per cent I find that one as easily penetrates wood as the other, and the amount used is from .25 to .5 pounds per cubic foot; and the object usually is to fill the wood with a certain amount specified of the solution chosen, and the penetration, owing to the low viscosity of the fluid, is usually nearly or quite to the center of many of the ties, which are almost the only timbers treated with zinc chloride. This will require from one to one and one-half gallons to the cubic foot, though I am well aware that more and of a weaker solution is frequently added in very soft wood, because it will take it; but it must be borne in mind that if the same amount of zinc chloride is put in, whether in a small amount or a great deal of water, after the water has evaporated the quantity of zinc chloride in the wood is the same.

In the case of creosote we have an entirely different class of preservative to deal with, and will be compelled to proceed on entirely different lines. Of late, for reasons not connected with this paper, it has become the fashion to use a creosote, or, rather, a mixture of creosote and undistilled tar of higher specific gravity and greater viscosity than that formerly used, and assuming it to be free from any perceptible amount of insoluble matter, it is still, owing to its viscosity, more difficult to force into wood, and will leave more near the surface than lighter oils, but taking an oil of from 1.03 to 1.06 specific gravity, I find that we ought to expect with a ten-pound treatment in piling, an average penetration of about one and one-half inches, and in bridge stringers, caps, etc., with twelve pounds of oil, about the same depth. Now we all know that this will vary a great deal. I am speaking now of the geometrical center of the stick. We will find a considerable difference in different parts of the same stick, sometimes within a foot or two of each other. Of course the ends naturally absorb the most, and it seems to take it until the capillaries become clogged; this end absorbtion will be as deep sometimes as seventeen or eighteen inches, and in very soft woods more; so, while we know we have a good deal of oil there, it must be left out of the question and borings taken far enough away to be beyond this specie of penetration. Also we will get different results on different sides of pieces of dimension timber, as one side may be heart and the other sap, and much will depend on the way the saw has cut it. Where the saw has cut across the rings, the summer wood, as it is called, consisting of capillaries, will take the oil more readily than the spring wood, consisting of cells. And again we will often in the same charge examine a large number of pieces and be very much pleased with their appearance, and then come on one having a very inferior treatment. But on the whole I think that the amounts specified per cubic foot in that size of material will be, as a rule, not far out of the way.

I know that at times I have got a greater average penetration with these amounts, and at other times less. I find in treating green wood after the manner I explained in a former paper to this society, only slightly changed in one particular, that the oil penetrated the pores of summer wood and not to any great extent the cells, and I get the same penetration with from two-thirds to three-fourths the quantity of oil. Now, therefore, as we increase the surface per cubic foot, in order to get the same penetration, we must increase the amount of oil, and here is where I am at a loss to specify the ratio of increase, but I think at present the nearest approach to a correct solution would be to increase the oil in arithmetical ratio to the increase of surface. There should be some effort made to settle upon an equitable mode of determining what any one should expect with a certain amount of oil in specified dimensions of timber, or, what is better still, to specify the depth of penetration required and pay for the oil used to obtain it.

THE PRESIDENT: We have another paper on this same subject by Mr. R. L. Allardyce, superintendent of the International Creosoting and Construction Company, Texarkana, Texas. As Mr. Allardyce is not present the Secretary will read this paper. We will then have the discussion on the two papers.

Secretary Angier then read Mr. Allardyce's paper, as follows:

WHAT PENETRATIONS ARE TO BE EXPECTED FROM THE DIFFERENT AMOUNTS OF PRESERVATIVES USUALLY SPECIFIED.

In giving me this subject I will have to say that it is practically impossible to give a correct solution to same as the many different species of woods as well as different treatments would have to be considered.

No one could in justice to themselves say what penetration could be expected unless they could see the material and know its conditions before treatment, and then could not say definitely what the penetration would be.

In my own individual case I would see that the timber was in the proper shape and that the full amount of preservative was injected that was called for and would be satisfied that I had given the results desired regardless of the penetration. You understand that I believe wood should be treated with as much preservative as can be injected—that is, to take care of the mechanical life of same, as the heavy treatments have always proven to have given the best results.

In this paper I shall confine my opinion to the treatment of southern pines treated by the full cell method, as I have had more experience in this class of woods for treatment and will not state positively that they should in every case have the following penetrations, as in some cases difficulties over which a commercial plant has no control may arise; unless the timber was all cut at the same time, seasoned the same and properly grouped a uniform penetration could not be expected, and the following is only an estimated average:

On piling for a ten to twelve pound treatment in soft or sap wood a penetration of from ¾ to 1½ inches could reasonably be expected.

In a fourteen to sixteen pound treatment, from 1½ to 2½ or 3 inches; for a twenty pound treatment, from 3½ to 4 inches, and in the heaviest treatments, say twenty-two to twenty-four pounds, from 4½ to complete penetrations. This is for the dead oil of coal tar treatment. In the heart wood you would not get as deep a penetration.

For straight zinc or the Burnettized treatment for ties, in using a twenty pound treatment of a light solution on loblolly ties, I should think that you could be able to get a complete penetration or up to the last inch or inch and a half of the center of the tie.

For short and long leaf ties this solution should be strengthened, and in no case would I be satisfied until I got as near a perfect penetration as possible, always getting not less than a hundred pounds pressure to the square inch on the retort.

To go any farther into the subject would be useless, as each operator claims for his particular treatment the best penetration, and in this paper I have dealt only with the straight oil and zinc treatments, and while you may consider that I have done so in a vague manner, I cannot in justice say what penetrations could be expected when I do not know under what conditions the treatments were given.

I have taken numerous borings from the pines, as stated above, and think the results as stated a fair average. To try and enumerate the many different treatments on the market would not be practical, and I regret very much that I cannot give you the different penetrations expected from them.

THE PRESIDENT: Both of these papers are now open for discussion.

MR. ALLERTON: Mr. President, Mr. Angier has a paper discussing these subjects, and perhaps it would be better to have it read before we open the discussion.

Secretary Angier then read the discussion prepared by Mr. J. C. Williams, superintendent of the Wood Preserving Works, Mauer, New Jersey, as follows:

DISCUSSION BY J. C. WILLIAMS.

The one thing in Mr. Allerton's paper which struck me most forcibly was the question he raises regarding the relation of the superficial area to the penetration when quantity of oil is specified in pounds per cubic foot. The idea had come previously to my notice in an article by Mr. Robert Hays, of the San Diego Southern Railway, and at that time I hastily (as I now believe) admitted the logic of it, but it was not until I read Mr. Allerton's paper that it occurred to me to do some figuring on this point, the results of which are as follows:

1 gallon of creosote will paint 150 square feet of surface.

118 gallons of creosote oil (1.02 gravity) are required to treat 1,000 feet, B. M., of lumber on a basis of 12 pounds per cubic foot.

The total superficial area of 1,000 feet, B. M., of 12"x12" timbers is 333 1/3 square feet, disregarding the area of the ends of the sticks. To paint this area would require 2¼ gallons of oil, which is 1.9% of the 118 gallons required to treat with. The area of 1,000 feet, B. M., of 6"x12" is 500 square feet, not including the ends. To paint this area would require 3 1/3 gallons of oil, which is 2.8% of the 118 gallons required. Similarly, 3x12's will take 4.7% of the oil for painting the surface, and 1x12's 12¼% of the specified quantity of oil to paint the surface.

This seems at first glance to be quite a serious matter, especially when you get into sizes where the area of the cross section is half a square foot or less, but Mr. Allerton says that with 12 pounds of oil in bridge stringers, caps, etc., we ought to get 1½" of penetration, and Mr. Allardyce says about the same in his paper. This is equivalent in 12"x12" timber to a factor of penetration of 23/100 of a gallon of oil persquare foot of surface per inch of penetration, and on this basis 3x12's should require 145.6 gallons of oil per M feet, B. M., equivalent to 14.8 pounds per cubic foot of wood; but you should then have them saturated through and through, together with an inch and half streak of double saturation the edge of the planks, when as we all know in actual practice 15 pounds of oil per cubic foot, nor any other quantity up to actual refusal, would not penetrate a thousand feet of 3" plank throughout. Now, if 1½" penetration is sufficient for a 12"x12", it is certainly too much for a 3"x12", because for ordinary construction work—under our present understanding that decay is the result of a fungus growth working in from the outside—a treated shell around the outside is all that is required, and consequently what is required on the 3"x12" is a creosoted area equivalent to the 1½" of penetration area in the 12"x12". Now, with 1½" of penetration in a 12"x12", we have a saturated area of 144 — 81 = 63 square inches, equal to 44% of the area of the cross section of the stick so that on this basis our factor of penetration is 2 1/9 gallons per cubic foot of actually saturated wood per inch of penetration. 44% of the area of the cross section of a 3"x12" is nearly 16 square inches, which multiplied by the required length gives us 36 5/16 cubic feet of saturated wood in 1,000 feet, B. M., of 3x12's, the same as the 12x12; but the penetration on a 3x12 to give a 44% saturated area is only 9/16 of an inch; so that it would only require about 49 gallons of oil, or 5 pounds per cubic foot of wood treated to paint and saturate 3x12's to the extent represented by 1½" of peneration in the 12"x12". That is to say, the less relative penetration required on the thinner piece more than offsets the painting of the extra surface.

Of course, you can't figure 1½" of penetration on a 1" plank, so I will stop at this point, hoping that some one else will demonstrate mathematically that Mr. Allerton's idea is correct, or explain why it isn't. It certainly seems to me that there is something somewhere that is not right, and it may be in my figures, which I submit merely to start the discussion into this line of thought.

It seems to me that the whole question of degree of penetration reverts right back to the question of the effect of the relative areas of heart and sap, and, of course, in a 12"x12" you have a much larger relative area of sap to help produce the 1½" penetration than you have in the 1" or 3" plank, and if you increase the quantity of oil in proportion to the surface area you don't increase your penetration, but simply super-saturate the parts of the wood that are susceptible to treatment without obtaining any better results.

One of the large eastern railroads specifies 10 pounds of oil per cubic foot for sizes under 8"x10" and 12 pounds for 8x10's and larger.

My present opinion is that this is correct—both mathematically and from the point of view of the possibililties of penetration relative to heart and sap—but I hold myself open to conviction in case it can be shown that I am wrong.

THE PRESIDENT: Is there any further discussion on this paper?

MR. BURKHALTER: The only thing that I could add to Mr. Allerton's paper and the very able remarks read by Mr. Angier would be the idea that certain timbers have such a very heavy end penetration that we might in specifications for such timbers require an additional amount of creosote simply to take up that end penetration. I am thinking of the Oregon fir, and I am under the impression that the end penetration is unusually heavy. You always get that heavy end penetration in addition to the lateral penetration that you are looking for, and on a scientific basis you should add to the required amount of oil to protect that point.

MR. ALLERTON: Mr. President, I have only a few words to say in regard to that paper. Every species of timber and many times sticks or pieces of timber of the same variety vary greatly in their adaptability to penetration. Also, the creosote oil used in this country varies a great deal. Some of it has less viscosity than others and will cover a greater surface. When we take the covering surface of timber it must be specified the kind of oil used, its viscosity, and also the timber, whether it is rough sawn or otherwise, and the species and the degree of seasoning, in order to arrive at any definite or just conclusion in the matter.

I will also say for Mr. Burkhalters' benefit that the penetration of the timber—I spoke about the end pentration, and said that in calculating the penetration from the geometrical center of the stick that the end penetration must be entirely left out of the question. Now, the penetration of oil in the wood, whether tie or piling or paving block, may be graphically represented as a wedge, the base of the wedge being the outside and that containing the greater oil, the apex of the wedge on the inside and containing the less amount of oil; so that in no case is the oil ever disseminated through the stick in exactly the same proportion; the most always being outside, and it will gradually lessen to the inside, the apex of the wedge.

MR. ROLLINS: I would like to ask if the remarks just made by Mr. Allerton apply to zinc chloride treatment? He used the term oil all the way through.

MR. ALLERTON: No, it doesn't apply to zinc chloride treatment, because that is a process where the timber is usually treated to refusal. In creosote it is another matter; a certain number of pounds are specified, and we don't expect on account of the viscosity to get that to the center. But with zinc chloride we may get it in an inch, a half an inch, or it may go clear to the center in any one stick. You can't tell what amount in any one stick in the charge will contain no more than we can in creosote, but the same amount of zinc chloride solution ought to penetrate deeper than the same number of gallons of creosote.

SECRETARY ANGIER: I think Mr. Allardyce struck the keynote when he said it was practically impossible to give a correct solution because of the many different kinds of wood as well as different treatments to be considered.

My experience has been that but very little penetration can be obtained with some kinds of wood, especially the heart.

Take beech, for instance; the sap wood is easily treated, but the heartwood simply won't take the treatment. Occassionally zinc chloride can be found in the heart, but only when the wood is well seasoned. I believe it is practically impossible to get a heart penetration in beech with creosote.

Tamarack and hemlock are very refractory woods to treat. With the exception of a little penetration in the ends of a tie, there is scarcely any penetration of creosote in the sides, while zinc chloride can be forced through the heart as well as the sap.

The heart wood of hickory is more easily treated than the sap wood, and in this respect it differs from almost every other kind of wood. It is not an uncommon sight to see the heart wood in a hickory tie thoroughly treated with creosote while the sap wood appears to be entirely untreated.

Red oak is, compared with many other woods, easy to treat when well seasoned, but when green, weighing, say 50 pounds or more per cubic foot, it is best not to attempt to treat it.

I have heard it stated that Douglas fir is more easily treated when green, but with an experience of treating more than three million Douglas fir ties, I prefer to have them seasoned at least six months before treating.

Mr. Allardyce confines his paper to the treatment of Southern yellow pine. We all know that loblolly and shortleaf pines are among the easiest woods we are called upon to treat. In the case of cross-ties and small material, there is no difficulty in getting about any pentration you desire, the trouble generally is with the wood absorbing too much creosote; in fact, when the wood is well seasoned, the absorption desired is usually obtained before pressure can be applied. In such cases the penetration is superficial when creosote alone is used, and the heart wood remains untreated. Longleaf pine is altogether a different proposition and it is usually quite difficult to get a deep penetration.

MR. ALLERTON: I agree thoroughly with Mr. Angier's statements just made, but I want to make an explanation in regard to my paper. I expressly stated that this was merely my opinion, that if wood received a ten-pound treatment in the proper manner we ought to expect nearly or quite an inch and a half penetration. Now, I know that there may be put in wood ten pounds of oil, especially if it is sap, and it might not show more than three-fourths of an inch penetration; at the same time, ten pounds of oil can be put into wood and show two inches penetration. It varies a great deal and we can only take the average. If the ten pounds of oil is put into the heart wood properly—and I am only speaking about heart wood in my paper, because stringers and bridge caps and timber of that kind usually contains no sap wood at all, I am speaking simply of heart wood—and if ten pounds per cubic foot is put in we ought to expect nearly or quite one and one-half inches penetration.

MR. LARKIN: There is just one question that occurs to me. I would like to ask Mr. Allerton if he means a point or a line, by the geometrical center of the stick?

MR. ALLERTON: A point in the geometrical center of the stick; that is, midway between the sides of the stick.

MR. LARKIN: And midway from the ends?

MR. ALLERTON: Miday from the ends, yes.

THE PRESIDENT: I would like to ask what has been the experience as to the influence in practical operation of the way the pressure is applied or the rate of pressure applied on the penetration which you obtain with various specified quantities of oil? Do you understand what I mean? Whether you get better penetration if you run the pressure pump rapidly and put the pressure at one hundred pounds as soon as you can get it and hold it there until you get the required amount of oil; or do you get better penetration by allowing the pressure to gradually rise?

MR. BURKHALTER: I should say that the rapid rise of the pressure line would give a better penetration, or result, in general, in less expensive treatment, and your re-flow would be more apparent from the rapid rise of pressure than it would in the other case.

MR. CARD: I think that is true with the partial treatment, but in full cell treatment if the pressure is run slow from the start you will get much better penetration than you will with the rapid rise on the start.

MR. ROLLINS: Mr. President, I think that creosote treatments, where the pressure is gradually raised and it takes a good long time to reach maximum pressure, will give more uniform treatment throughout than if, as soon as the cylinders are filled, you run the pressure up to the maximum within say, ten or fifteen minutes. I think you get more uniform results by gradually reaching your maximum pressure.

THE PRESIDENT: This question was suggested by a point in Mr. Allardyce's paper in which he makes the statement that he would have to have at least one hundred pounds pressure. It has been my experience sometimes in the treatment of timber where you are treating ten or twelve pounds per cubic foot, if you apply the pressure rapidly you will get in your ten or twelve pounds before you reach a hundred pounds pressure. A great many specifications today state that the pressure shall not be less than a certain specified amount, shall not be less than one hundred pounds. Now, in a specification of that kind the question is do you get the best results and get the required amount of oil by slowly applying the pressure where the required amount of oil is forced in before you reach the minimum specified in the specifications.

Is there any further discussion on this subject?

MR. STERLING: While you are on that subject I should like to broaden it by asking if any one has had experience in fluctuating the pressure? This has been talked of and probably tried by some people. That is, instead of a uniformly fast or uniformly slow pressure, has anyone tried to fluctuate between quite wide limits?

MR. WEISS: From the limited number of treatments that we have made thus far we have found that if you apply a pressure rapidly—that is, try to get a pressure of one hundred pounds as quick as you can in your cylinder—the tendency will be for the absorption to become erratic. In other words, one stick of timber will have considerably more of the preservative than another stick, although the average absorption in your cylinder may be what you are trying to get. If the rate of application of pressure is more uniform, the tendency for erratic results in penetration is considerably less, and you are more liable to get greater uniformity in the distribution of the oil in the wood. In treating red oak and loblolly pine it appears that greater uniformity of results are secured by applying the pressure in steps of twenty-five pounds each, that is, twenty-five, fifty, and seventy-five, etc., rather than force your pumps immediately up to a pressure of one hundred or one hundred and fifty pounds per cubic foot. Those have been the observations we have made thus far. Just how they will apply to other classes of timber and other preservatives, I can not state.

THE PRESIDENT: Any further discussion? Has anyone anything to say on the point Mr. Sterling brought out?

MR. WORKMAN: Most of the engineers that I have met in England do not lay great stress upon the penetration of creosote oil provided they get the eight, ten or twelve pounds specified per cubic foot. This quantity certainly takes care of the sap wood; and the heart wood, which is not saturated, is considered to take care of itself. It is therefore the object of the creosoter to get this specified amount of oil in as quickly as possible, rather than aim at deeper penetration by putting on the pressure more slowly.

A rather interesting case arose with some friends of mine who had creosoted material for a customer apparently not very thoroughly acquainted with the possibilities of the trade. The material was objected to, as on being cross-cut, the apparent penetration was slight. On cutting a white piece out of the center of one of the logs, and placing it in a vise, a considerable amount of colorless oil was squeezed out, showing that a considerable filtering action takes place, and that the penetration is deeper than the black, carboniferous portion of the oil indicates.

MR. CARD: In running up the pressure too fast, you lock in the air more or less, and that retards the absorption. In running the pressure up slowly, the oil displaces the air, the air gradually coming out and the oil going in. For that reason you will get better penetration by running the pressure up slowly than by running it up quickly, in my opinion.

THE PRESIDENT: Mr. Workman has brought out a point that is interesting. It brings up the question, is it always possible by visual means to tell what penetration of creosote you have? In other words, when you cut a stick or bore into a stick you find a certain portion of that stick black, is the point where the black stops and the white commences the depth of penetration? I don't know whether any one here has experimented along that line or not. I would like to have them say something if they have.

MR. ALLERTON: I might as well state that the penetration of the creosote is greater than the visible coloring of the wood.

I demonstrated that a number of years ago that light oils like napthalene in the Oregon fir that I was treating, and the only timber I tested, had oil one-eighth to one-fourth of an inch below the visible penetration. Of course, the fine particles of carbon is what give the color and those are so minute, colloidal carbon I believe they are called, that they carry in with the oil to nearly the full depth, but beyond that there is always found a space that contains light oil and napthalene beyond the coloring of the wood.

MR. CHURCH: I think that is a very interesting point Mr. Allerton has raised. I would like to know whether he or anybody else has made such analysis of extracted oils as would lead them to say positively that there is a separation of the lighter portions of the oil as the oil gradually penetrates towards the heart of the wood.

MR. ALLERTON: Mr. President, wood is a filter. As a solution of zinc-chloride goes in the wood it is filtered out, and always you will find a smaller quantity as you go into the wood; as you follow the wedge in you will find that the zinc-chloride has been filtered, and that the zinc is less in quantity as you go towards the center.

MR. NEWTON: I think the government service at one time issued a bulletin in regard to the possibility of fractionating petroleum by capillary tubes. Whether it was highly successful or not, we do not know, but it showed the possibility of at least a partial fractionation of light petroleum oil through capillary tubes. Probably the same laws apply in the capillaries of wood as they tried to utilize for the fractionation of oil. How successful that was or how it was carried out, I don't know, because as I remember it now, the bulletin gotten out was mere progress report on some work that was not yet complete.

THE PRESIDENT: If there is no further discussion, we will go on to the next number of the program, a paper by Mr. F. J. Angier, Timber Treating Engineer, the Kettle River Company, Consulting Timber Treating Engineer, C., B. & Q. R. R. Company, on "Some Results Obtained in this Country in Prolonging the Life of Railway Cross-Ties by Preservative Treatment as Shown by the Records that Have Been Kept; and a Better Method of Keeping These Records."

Mr. Angier then read his paper, as follows:

SOME RESULTS OBTAINED IN THIS COUNTRY IN PROLONGING THE LIFE OF RAILWAY CROSS-TIES BY PRESERVATVE TREATMENT AS SHOWN BY THE RECORDS THAT HAVE BEEN KEPT; AND A BETTER METHOD OF KEEPING THESE RECORDS.

This very interesting subject was assigned to me by your Program Committee. Please note that results are wanted "as shown by the records that have been kept." Perhaps more reliable results could be obtained if we would ignore the records entirely and rely upon the memories of men of observing minds who, for many years have made a study of the life of timber, but who have neglected to keep book records. I mean that nearly all records of treated cross-ties kept for a period of eight or more years, are more or less inaccurate, or at least have so many uncertainties hanging over them as to be wholly unreliable. This may be illustrated by the record the writer attempted to keep for a railroad company for a period of ten years, and which is explained in detail in another part of this paper.

After all the trouble and expense of keeping this record, the results showed that only 102,000 ties out of a total of more than five and one-half million—less than 2 per cent—had been removed for all causes. On one division this record shows five ties removed in ten years, although 435,000 had been put in track. You say this is absurd: then of what use is this record? It is needless for me to say to you that it was discontinued and another method adopted to ascertain the life of treated ties. This will also be explained in another part of this paper.

The writer has been unable to find any very reliable records of treated ties that have been in track for any reasonable length of time. The opinion of those who have given some thought to the subject, is that well treated ties will resist decay from two to four times as long as the untreated wood. Much depends upon the location of the ties and the method of treatment. An untreated pine tie in the South lasting two years, may give a life of four or five years in the North, and in the arid States this same tie may possibly resist decay for eight or nine years; so whenever we speak of the life of ties, we must not overlook this very important factor.

In considering the maximum life to be obtained from a tie, the mechanical wear upon it is also a very important factor. It is certainly a waste of money and energy, as well as a very foolish thing to treat a tie to resist decay for twenty or twenty-five years, when we know or expect its mechanical life to be only one-half as long.

The general average of the life of white oak ties (not treated) reported by twenty-two well-known railroads of the Northern States, located both east and west of the Allegheny mountains, is eight and one-fourth years, according to a report made by the American Railway Engineering & Maintenance of Way Association. The figures taken into account in this average were supposed to represent the life of ties which had failed by natural decay and not by rail cutting. In the Southern States the life of white oak ties is said to average five or six years.

Mr. W. L. Breckinridge, Engineer Maintenance of Way of the C., B. & Q. Railroad, says the average life of untreated white oak ties on that road is ten years; white pine is about five years. He further says that about 90 per cent of all their untreated ties fail account of decay.

The Atchison, Topeka & Santa Fe Railroad has been treating their cross-ties perhaps for a longer time than any other railroad company. They have always kept some kind of a record, and these records show an average life of about ten and one-half years. In a recent letter received by the writer from Mr. Geo. E. Rex, manager of the Tie & Timber Department of the Santa Fe Railroad, he says that they have not prepared a statement during the last two years, owing to the unsatisfactory information they had at hand.

A statement taken from the Chicago & Eastern Illinois Company's records, made December 31st, 1909, shows only 9½ per cent removed, account of decay, from a total of 111,816 ties treated in the year 1899. From a total of 1,647,605 ties laid during the years 1899 to 1909 inclusive, the records show only 1.1 per cent removed due to decay. This record was made by placing a dating nail in each tie as treated and laid, and depending upon the section foremen to hand in correct reports of ties put in and taken out of track. It has proven a very unsatisfactory method of keeping a record and doubtless many inaccuracies occur.

A committee that investigated the treated ties on the Illinois Central Railroad, reported that red oak, gum and beech, treated with zinc-chloride will last at least double that of white oak ties in the South, and equally as long as white oak in the North; and that the percentage of failures so far found is less than white oak in all localities.

The following is taken from a paper written by Mr. C. T. Barnum, appearing in the Journal of the Western Society of Engineers for June, 1910:

"Properly creosoted ties can be made to last until destroyed by mechanical wear, and if protected against this wear can be made to give twenty to thirty years' service. With the proper kind of treatment, a pile can be made to last from twenty to twenty-five years. The L. & N. R. R. Co. in 1882 used large quantities of creosoted piles, stringers and caps, in the construction of trestles and docks, in the vicinity of Pensacola, Fla. All of this material gave a service of over twenty-five years.

"The Forest Service has estimated that proper preservative treatment will increase the life of ties over 200 per cent, poles 100 per cent, posts 300 per cent, piles 700 per cent, mine props 400 per cent, and lumber 300 per cent. These figures are made up of the average estimates of treated and untreated life for the various forms all through the country, and under all conditions, so they naturally give merely an indication of the results of treatment which, in specific instances, may be much more or less than the general average."

Mr. Octave Chanute said that when he began work in timber preservation, about twenty-four years ago, they followed the German practice of injecting about one-third of a pound of zinc-chloride in a cubic foot of timber, and obtained an average life of eleven and one-half years with hemlock and tamarack ties. Since then we have ascertained that the Germans, in their extended experience, have increased the dose to one-half pound per cubic foot, and with that we are now obtaining results (now ten years old) which promises a life of fourteen to seventeen years in the track.

He further stated that if creosote be thoroughly injected into wood with the full-cell process, the results which have been obtained in Europe show that a life of twenty to twenty-seven years can be obtained. But there is one element there which does not obtain in this country. The rolling stock on the European railroads is light; the weight per wheel is limited to about 10,000 pounds, while the weight of our modern freight cars is much greater. For instance, a car weighing 49,000 pounds and carrying 100,000 pounds will give wheel pressures of about 18,000 pounds per wheel. Those weights are all producing mechanical wear, so that the ties, whether treated with zinc-chloride or creosote, are going to be destroyed by mechanical wear sooner than by decay.

The writer fully realizes that it is the practice in this country to inject a minimum amount of preservative, or at least to endeavor to inject just enough to counterbalance the life of a tie from the standpoints of decay and mechanical wear. This happy medium is what we are all striving for and desire, but is it not possible that we are making a mistake in treating with what we call "empty cell processes"? We know that thousands of ties are being treated with small doses of creosote, in many instances ranging from twelve to twenty pounds per tie, with only a superficial penetration. With many of our inferior woods now being used for cross-ties, the heartwood remains practically untreated, and with the more refractory woods, even the sapwood is not entirely impregnated. With such treatment are we not going to be very much disappointed in the life obtained?

In "Track Deformations," written by G. Cuënot, Chief Engineer, Paris-Lyons-Mediterranean R. R. Co., and translated by W. C. Cushing, in reference to pine, spruce and beech, he says:

"These woods season rapidly and are capable of absorbing a quantity of creosote sufficient to render antiseptic the small amount of sap which still remains after seasoning (about 20 per cent). But it is necessary to creosote to refusal, which requires the employment of at least 55 pounds of antiseptic liquid for a tie of 8.53 feet; under these conditions the sap is, so to speak, surrounded by creosote, and any fermentation is impossible. With a smaller dose, the sap not being given immunity, enters into fermentation, and decay commences; this has been observed when the amount of creosote is reduced to 35½ pounds.

"We will cite only one case to show the influence of creosoting to refusal: Of 1,152 beech ties, injected after this manner, and placed in track in 1877, all were as sound in 1896 (nineteen years after placing them) as on the first day, while 1,204 ties placed in 1899 on the same line, which were only injected with 37½ pounds per tie, were entirely decayed, in the proportion of 35 per cent, at the end of six years."

October 1, 1900, 550 red oak ties, treated with one-third pound of zinc-chloride per cubic foot (in this case solution was made of such strength that treatment was carried to point of refusal) were placed in track near Mystic, South Dakota, on the C., B. & Q. Railroad. These ties were inspected by Mr. J. H. Waterman, Superintendent Timber Preservation, on October 9, 1910, aften ten years' service. Mr. Waterman says: "Not one tie has been removed for any cause. The rail has been changed once or twice. The ties are laid on a 3 per cent grade and a 12 degree curve. From the surface appearance they will last at least five years more, and I will be disappointed if 50 per cent are not in track ten years from this date."

These ties were treated by the writer and received exactly the same treatment as were given all other ties at that time, but it should be understood that the climate around Mystic is comparatively dry; and further, the ballast in which the ties were imbedded is limestone, which in itself absorbs more or less moisture and thus affords protection to the ties.

April 17, 1894, sixty hackberry ties were laid in track just west of Gillette, Wyo., on the C., B. & Q. Railroad. They were treated with zinc-chloride by the Santa Fe Railroad Company and shipped to the Burlington. A careful record has been kept of these ties, and when last inspected by Mr. Waterman (October 6, 1910), he says:

"Originally there were sixty ties placed in track. Twenty-five per cent are still in track and apparently in a good state of preservation. They have been in track now over sixteen years."

This is another case of ideal climatic conditions. If these same ties were placed in track in Illinois, or in Texas, the results would have been altogether different in all probability.

The Committee on Wood Preservation of the American Railway Engineering & Maintenance of Way Association, in their 1909 report, gave some preliminary deductions based on statements received from thirty-six out of thirty-nine members of the association who were selected as likely to possess information relative to the life of treated timber:

(1) "Creosoting may be relied upon to preserve piles from twenty to twenty-five or more years, if they are injected with 16 to 24 pounds per cubic foot.

(2) "Creosoting at present cannot be relied upon to preserve ties more than fifteen and one-half to nineteen years, an absolute maximum, unless the ties are protected against mechanical destruction. If badly injected they perish from decay in five to twelve years.

(3) "Burnettizing, when well done, can be relied upon to preserve ties from ten to fourteen years. The amount of injection varies with the proposed subsequent exposure. In arid climates one-quarter pound of dry zinc-chloride per cubic foot may give good results. In moist and warm climates not less than one-half pound per cubic foot should be injected. There are great differences in the thoroughness with which the work can be done.

(4) "The zinc-creosote process has been too recently introduced (1904) in this country to give definite conclusions; it has given ties a life of twelve to eighteen years in the track in Germany."

In another report by this same committee they say that untreated white oak ties last seven to twelve years, pine five to eight years, chestnut eight and one-half years, cedar fifteen years, tamarack five to six years, hemlock five years, cypress seven to nine years. Seventy-five to 98 per cent of white oak ties fail from decay, and 2 to 25 per cent from rail and spike cutting; 75 to 90 per cent of other ties fail from decay, and 10 to 25 per cent from rail and spike cutting.

Mr. W. A. Clark, Chief Engineer of the Duluth & Iron Range Railroad Company, says: "In the fall of 1890 we placed in our main track 256 ties, of which eighty-five were white pine, eighty-five tamarack and eighty-six red Norway, all treated by what I understand was the Wellhouse process. The track in which they were placed was at the time single track, but the road was shortly afterward double-tracked and the grade at this point revised so that many of the ties were damaged and could not be used over again at that time. After double-tracking, these ties were in our north-bound track, which carries our light trains to the mining districts. A few of these ties were only removed the past season, but nearly all of them had been removed by 1908. We estimate that the average life of the ties which were not damaged when the double-tracking was done was about fifteen years. I might add that the ties had been seasoned since the winter previous before treating, and they were laid in gravel ballast, which is frozen solid probably an average of five months in the year, which might account for part of their long life."

KEEPING A RECORD OF TIES.

For ten years it was the practice on the Burlington Railroad to drive a dating nail in every treated tie. The first eight years the nails were driven by the section men after the ties were laid in track, and the last two years the nails were driven at the treating plant after the ties were treated. The head of the nail bore the imprint of the year in which the ties were treated, and was for the express purpose of enabling the management to keep a record of treated ties. Without a nail or mark of some kind, there is no practical way of knowing at any future time whether the tie was treated or untreated, or whether it had been treated one, two, or more years.

There are nearly 1,500 sections on the Burlington System, and each section has a foreman in charge. In keeping this record, every section foreman was required to make a monthly report showing the number of ties put in and taken out of track. They were obliged to show the year treated by examining the dating nail, and also to state why they were removed, whether because of decay, rail cut, burned or broken.

From the foregoing it can be readily seen that, for a correct and complete record, everything depended absolutely upon 1,500 section foremen. The average section foreman is not a clerk, and not much dependence can be placed upon him to give in reliable data. Even were he able to make the finest kind of a report, he will be unable to decipher the figures on the heads of thousands of rusty and battered dating nails, and he either guesses at the correct date, or writes on his report "illegible." Then again, no matter how many letters of instructions are written, or how often you talk in person to these men, there will be thousands of ties placed in the track without dating nails in them, and other thousands of UNTREATED ties bearing dating nails which should not have been driven in them.

For the sake of argument, we will assume that every section foreman sends in reports absolutely correct; that whenever he removes a tie he puts in another, and in every case he shows the year treated correctly. Under such conditions, what kind of a record have you when every tie contains a dating nail? A tie is a tie, it matters not whether it is made of oak, pine, chestnut, cedar, maple, beech, or any one of fifteen or twenty other kinds of wood. Your record then cannot show which kind of wood is giving the longest life. There may possibly be some particular kind of wood that is giving only one-third, or one-half the life of other treated wood, but how are you going to know from the record? Your record shows that so many ties are taken out each year, some for decay, others for rail cut, breakages, etc., but does your record show that gum ties are breaking in greater numbers than elm, or that maple ties are being destroyed much more by rail cutting and spiking than beech or ash ties? Does it show whether zinc-chloride will preserve a tie as long as creosote, or that five pounds of creosote per cubic foot of timber is as economical as eight or twelve pounds? These are some of the questions you want answered, and they never can be answered by simply putting a dating nail in every tie, and depending upon the nail and the section foreman to give you a correct report.

After an experience of ten years with such a record, the Burlington abandoned it and adopted the following method:

The Burlington System is divided into nineteen divisions. On each division there is placed from 1,000 to 5,000 specially treated ties. (A description of one test track of 1,000 ties will illustrate the method.) The ties were carefully treated and marked as shown in the following table:

EXPERIMENTAL TIES—1000 Placed on Each Division.

KIND OF WOOD	TREATED.						UNTREATED.		Total No. of Ties
	Card Process		Straight Creosote.		Burnettizing.				
	No. of Ties.	Mark.	No. of Ties.	Mark.	No. of Ties.	Mark.	No. of Ties.	Mark.	
Oak, White	15	W	..	....	..	....	5	W-X	20
Oak, Red	50	R	10	R-Y	10	R-Z	10	R-X	80
Oak, Pin	35	N	15	N-Y	..	....	5	N-X	55
Beech	40	I	20	I-Y	10	I-Z	10	I-X	80
Hickory, Pignut	15	K	..	....	..	....	5	K-X	20
Ash	15	A	..	....	..	....	5	A-X	20
Elm, White	42	E	10	E-Y	7	E-Z	8	E-X	67
Maple, Hard ...	35	M	3	M-Y	..	....	5	M-X	43
Maple, Soft	35	F	8	F-Y	7	F-Z	5	F-U	55
Birch, Red	40	B	..	....	..	....	8	B-U	48
Chestnut	15	Q	..	....	..	....	15	Q-X	30
Tamarack	47	T	8	T-Y	8	T-Z	8	T-U	71
Hemlock	47	H	8	H-Y	7	H-Z	8	H-U	70
Tupelo Gum....	40	V	9	V-Y	7	V-Z	8	V-U	64
Red Gum.......	39	G	8	G-Y	7	G-Z	9	G-U	63
Shortleaf Pine....	45	P	7	P-Y	7	P-Z	10	P-U	69
Sycamore	15	S	..	....	..	....	5	S-U	20
Cottonwood	27	D	8	D-Y	..	....	5	D-U	40
Cypress	35	C	..	....	..	....	10	C-U	45
Poplar	35	L	..	....	..	....	5	L-U	40
	667	..	114	....	70	....	149	....	1000

EXPLANATION.

Each kind of wood is designated by a letter stamped on the head of a nail driven into the tie, on the top side, about thirty-four inches from one end.

Burnettizing Process (or straight zinc chloride) is designated with the letter "Z," following the letter designating the kind of wood. For instance, "R-Z" means a red oak tie treated with zinc chloride only.

Straight Creosote Process is designated with the letter "Y," following the letter designating the kind of wood.

Card Process (or a mixture of creosote and zinc chloride) has no letter, and a tie containing only the letter designating the kind of wood, in addition to the dating nail "09," means that it has been treated with the Card Process.

Untreated ties are designated with the letters "X" and "U." "X" means that it is an untreated "hardwood" tie, and "U" an untreated "softwood" tie.

Note that each kind of wood, as well as each kind of treatment, is designated with nails. A careful record is kept of every charge of ties treated and used in this test, to show the details of the treatment as to seasoning, steaming, pressure, vacuum, etc., as well as the amount of preservatives injected. Whenever a tie is removed, it cannot be disposed of until permission is given from the timber treating department; its location in track is determined by the blue-print record reproduced herewith. Here it will be noticed that the ties are placed in one continuous stretch of track, and alternated with the different kinds of wood, and with the different methods of treatment, and with untreated ties.

This test need be made but once in ten years. The record will show not only the relative lives of treated and untreated ties, but also the relative lives of the different kinds of wood and the different processes of treatment, not only from the standpoint of decay, but also from a mechanical standpoint. It will show whether a cottonwood, a poplar, or a pine tie will fail from decay or from rail and spike wear sooner than a birch, or a tamarack, or a hemlock, etc. Again, only nineteen section foremen, instead of 1,500, are required to look after these tests, and being so few in number, a representative of the timber treating department personally inspects each test track once a year or oftener, as the case may require, and sees that the nineteen foremen understand and are properly looking after these tests. The general manager, general superintendent, superintendent, and others are all personally interested, and have handed down explicit written instructions to all concerned. Suitable stakes with copper plates mark the beginning and ending of every test track.

Of course, it must be assumed that the ties in each of these nineteen test tracks fairly represent the conditions of service and life of ties over the particular district in which they are located. In selecting the locality for making the tests, average conditions, as much as possible, should be considered. Two or more test tracks may be located on each division if it is found that climatic conditions vary to any great extent. The method is certainly simple and inexpensive, and is believed to be much more accurate, and a great improvement over the old method of placing a dating nail in every tie.

To put a dating nail in every tie treated on the Burlington (about 2,300,000 per year) would cost in round figures $8,000.00 a year for labor and material. In ten years this would amount to $80,000.00. To make the special tests, placing 5,000 ties on each division once during the ten years, would cost about $5,000.00. The saving in ten years would therefore be $75,000.00, plus interest.

THE PRESIDENT: Before we begin the discussion of this paper, Mr. William A. Fisher has a paper here on some results from treated ties along the South Atlantic Coast.

Mr. Fisher then read his paper, as follows:

I have here a statement of some results that may be interesting, because I believe this is the first time they have been made public to the credit of coal tar creosote.

In the spring of 1887, there was treated for the A. C. L. R. R. Company a test lot of about 250 North Carolina, longleaf pine cross-ties, the work being done by the Wilmington Creosoting Company in one of the pressure cylinders which it was then operating in that city. This company has since gone out of existence and the more valuable parts of the plant moved elsewhere. In June, 1887, these ties, divided into two lots, were placed in the main line of what is now the Wilmington and Weldon division, 112 near Goldsboro, North Carolina, and 140 near Halifax, in a light sandy loam. At the time of our latest report on these ties, in September last, over sixty per cent were still in use as originally laid, and a large proportion of these were said to be good for several years more of service. No record concerning these ties has been kept, and no one could say with certainty just what preservative material was used. It has been maintained by some interested people that the ties in question were treated, not with dead oil of coal tar, but with so-called wood tar creosote (a material obtained by the distillation of pine wood), and in order to settle the question, a chemical examination of a piece of one of the ties was ordered. This work was done by one of the best known firms of public chemists in the South and they reported:

"We beg to advise that we have made a careful examination of the creosote oil which we extracted from the piece of cross tie received from you, and we find that the oil consists of the heavier portions of coal tar creosote. Of course, in the long exposure which has elapsed since these ties were creosoted, the lighter and more volatile portions of the dead oil have evaporated, leaving behind a high percentage of the napthalene and anthracene constituents."

These ties were, of course, of an excellent grade of timber and contained but little sap wood, else they would not have given the long term of service which has been gotten from them. The greater part of the ties which have been removed have been taken out on account of rail-cut, though a very few were removed because of decay.

THE PRESIDENT: These papers are now open for discussion. I believe we have quite a number of railroad men present. They can add something of value to this discussion.

MR. ROLLINS: I understood from Mr. Fisher's paper that they found some napthelene in these ties, and I would like to have that reaffirmed, because I might have misunderstood him.

MR. FISHER: That was the report of the chemist who made the analysis.

THE PRESIDENT: I believe that recently Mr. Waterman made an examination of some ties placed in the track by the Burlington. Will you tell us the results of that investigation?

MR. WATERMAN: Mr. President, Mr. Angier referred to those red oak ties that were laid in the track at Mystic. Mystic is near Deadwood, South Dakota. They had been in ten years. They were treated, as he said, with zinc-chloride. He treated them at the plant which was then at Edgemont. I made a careful examination of the ties with the roadmaster. There were 550 ties originally laid in the track and, as Mr. Angier has quoted me, they are still there, not one of them having been removed notwithstanding the fact that for at least three or four rail lengths the ties showed on the face of them that there had been a car or engine off the track, still not one of them had mashed down, and they were all in a good state of preservation; and as I also say in my report, I will be disappointed if in ten years I go or some one else goes there and do not find at least fifty per cent of them in the track.

Now, referring to the other ties I examined on the division lines west and at two points on the lines east where the ties were lain as per this diagram which you find in the paper which Mr. Angier prepared, I found this, that all the inferior woods, every one of them, especially beech, birch, soft maple, and hard maple, gum, cottonwood, and poplar, that was not treated, every one of them showed decay. You will note if you examine this diagram carefully that they are laid promiscuously, or at intervals, all through the treated ties, and they all showed more or less fungi on the end of the ties. I wish I could have had a kodak. Next year when I go out to inspect them I am going to take a kodak along and take some pictures, and if I live long enough till you have your next meeting, I will bring the pictures with me to show you the result.

Every one of these woods, as I say, showed more or less decay. At Galesburg, we took out one tie and I will be disappointed if ninety per cent of the inferior woods that are laid in these experimental tracks are not taken out in two years on account of decay. Right side of them the ties treated with different processes were in a good state of preservation, not one of them showing any decay at all. The only suggestion I would make if any of you gentlemen want to make a test similar to this, is to put all your untreated ties together in one rail length. I will explain to you why. I don't know whether I told Mr. Angier this or not, but this is what you will find: If you have a treated tie laid in the track and then an untreated tie and then a treated tie, if the treated ties are in a good state of preservation, they carry the load for the untreated tie. If the untreated tie becomes decayed or has more or less mechanical wear, it would not come out as soon; you wouldn't have to take it out of the track so quickly as if all the untreated ties were laid together. I think most of you will say that this is practical and is the fact. I believe that if the beech ties, the birch ties, the cottonwood ties, and the other ties that were untreated had been laid in a string, laid one after the other one, two or three rail lengths together, that every one of them would come out in less than two years.

THE PRESIDENT: Mr. Parminter, you have had occasion to get around and observe results obtained in this country. Let us have the benefit of some of your observation.

MR. PARMINTER: Mr. President, I don't think that I can offer you anything in the way of data. As to the longevity of treated ties and untreated ties in any particular place that would bear on this subject, I could perhaps give you some data in regard to the lasting qualities of some of the ties that have been put in by the plants in the South. In Mexico, there are several instances of ties being in for ten, twelve or fourteen years. As to treated lumber, I saw an instance about eighteen months ago of a bridge taken out on a Mexican road that was put in in 1871 and the plank were still there about half worn in two, and they still have them. They showed no signs of decay. There are some ties that were put in in Mexico City in 1898 that are still there. That is about all I know about it.

MR. TAYLOR: We are still using ties put in in 1876. That is the longest life we have got. There has always been a good deal of contention among the water gas tar people, the petroleum tar people and the creosote tar people as to what kind of oil they were treated with. For the sake of all of them, we have not decided.

THE PRESIDENT: Mr. Chanute, I believe a year or so ago you had occasion to make an examination along this line. We would like to hear from you.

MR. CHANUTE: We find, as Mr. Angier found, that the great trouble is in keeping the records. The Rock Island and the Sante Fe kept their records pretty well for a number of years, but finally some of them were burned up and the roads moved their offices, and the records became jumbled. The C. & E. I. Ry. are now keeping a very good record. The great trouble is to get the railroad men to keep accurate records.

MR. PARMINTER: Can't Mr. Rex or some one else familiar with it tell us something about that test track down there? I think that would perhaps be interesting.

MR. REX: I guess Mr. Parminter refers to the Texas track put in by the government in 1902. A section of track was picked out where decaying conditions were considered the very best of any point on the Santa Fe system and put in ties both treated and untreated and by all processes then in use and all the timber that is used in this country. Ties were shipped there from the North treated by Mr. Chanute, Mr. Angier, the Santa Fe with the various processes, and the International Creosoting Company, and the last report that was made on that track was in July, 1909. A great many of the ties, of course, were taken out. The ties were put in first without tie plates and with small rails, and a great many of the failures were due to mechanical wear. A little personal examination of that particular piece of track will give the people interested in the treating business a better insight into what is good and what isn't good, than almost any piece of track I know of. Unfortunately for the experiment, it was before the days of creosoting of ties, and there are no creosoted ties in this particular piece of track.

We expect to make the inspection of this track about the seventh of next month, and I would be very glad to hear of anybody that would like to spend the time and go over this piece of track with us. We have seven or eight people who have expressed a desire to go. If any one will take the time to go down and see that piece of track, we would like very much to have them with us.

(For Report of Committee, see page 236.)

MR. BURKHALTER: Mr. President, I would like to ask if it would not be a good idea or if it would be possible before the proceedings are published, to get some member of this party, all of which are competent, to write his opinion after the investigation for publication in the proceedings. I think it would be of great value to the Association. What do you think about that, Mr. Rex?

MR. REX: The Association might appoint a. representative on behalf of the Association to accompany us on this inspection. We would be very glad to co-operate with him in making a report for the Association.

THE PRESIDENT: I believe, Mr. Burkhalter, that the time is coming, and that soon, when this Association will have to have representative committees on the various topics along that line, and others, which committees will make certain investigations during the year and report their findings to the Association. That is something that has never been done, but I believe the Association will come to that in the near future. I would like to ask Mr. Pooler, of the Chicago, Milwaukee & St. Paul, to tell us something of their experience.

MR. POOLER: Mr. President and Members of the Association: We have been using treated ties on our road since 1902, but it was not until 1906 that we began keeping a regular record. I think some of the first ties that were put in were not marked at all, but in 1906, we got up a book in which we are trying to show all of the treated ties of each kind placed in track each year, and number taken out, of each year's treatment.

I have recently taken up the tie business on our road, and since then have been giving a good deal of attention to treated ties, and am not entirely satisfied with our treated tie records up to this time. We have met with the same difficulty which Mr. Angier spoke of; that the Section Foremen and others in charge of track, do not seem to be able to give us accurate records of treated ties taken out of track. We have been marking these ties with nails. At first we depended on trackmen to drive the nails into the ties at the time the ties were placed in track. Later on, and for the last two or three years, we have been having the nails driven into the ties at the treating works, which is a very much better plan. But I am convinced we will never get an accurate or satisfactory record until we take certain pieces of track and keep a record not only of the treated ties, but of the untreated ties. Last year we laid considerable second track with zinc treated red oak ties. It is my intention to start a record, of say, one mile of that track where the ties are laid "out of a face;" that is, continuously, and keep an accurate record of the year the ties are taken out or track and cause of removal.

I suppose Mr. Weiss has told you about the tests he is making with our ties at the Forest Products Laboratory at Madison, and we hope for good results from this test. I will say, however, that it is my intention to keep up the old record already begun and do all I can to get it accurate; but in addition to that, I want some pieces of test track on different portions of our system where climatic and ballast conditions vary as much as possible, and hope later on to have some reliable information to report at future meetings of the Association if I am fortunate enough to be present.

MR. CHANUTE: That calls to mind an illustration of the trouble we have in getting returns from the section foremen. In 1882 we treated forty-nine ties; I think it was for the Santa Fe Road by the Wellhouse Process. They were laid at La Hunta, Colo., and we examined them fifteen years later, finding forty-four still in the track. The supervisor told the section foreman to be very careful of the small brass tags nailed on to the ties. A couple of days afterwards, upon returning to his office, he found a little package on his desk, and upon opening it he found all the small brass tags. This is the kind of results you get from some section foremen.

MR. POOLER: I would like to ask the Association, Mr. President, if there is any better way of marking the ties than with nails. The difficulty appears to be that nails become rusted, so that the marks cannot be read when ties are taken out of track. The nails we use have a small letter, showing the kind of treatment, and a figure indicating the year in which the tie was laid in track; but roadmasters tell me the men cannot read these figures, and in some cases probably do not take the pains to clean off the top of the nail. We have used tags, but they did not prove a success. I have thought if we had nails with heads of different shapes to show the different kinds of treatment, it would be a help.

THE PRESIDENT: Has any one anything to offer on Mr. Pooler's question with reference to something better than the dating nail?

MR. REX: In answer to Mr. Pooler's question, I will say that I made an examination of a piece of experimental track on one of our southern divisions. We have resorted to experimental sections, one section on each Superintendent's division, for the keeping of our records. We take a regular section foreman's section and keep a complete record of that. The representative of the treating department first makes a thorough inspection of that section, making a record of all ties found in the track and follows that up of course by seeing that the section foreman on that particular section marks all ties put in thereafter. The particular section that I speak of was of interest on account of the subject Mr. Pooler brought up. On that section, the Rio Grande division, where conditions are ideal, of course, they have very little dampness. I have found on examination of those ties, a great many of the old treated ties put in when we first started our Las Vegas plant, those ties were all marked with a stencil on the end of the tie; we marked all our ties up to 1900 with a stencil on the end, and we quit marking ties in that manner on account of trouble we had in beating up the end of the ties by the section men—but to my surprise and gratification I found, for instance, in that particular section six, I believe, 1885 ties, with the stencil on the end of those ties as clear as a bell. We found ties in that section for every year since 1885. In 1888, we found, I think, 176 ties. Mr. Taylor was telling me today that he had just expected to start the marking of all ties with a stencil on the end, and I think he is making one of the wisest moves he ever made in adopting that stencil. As supplementary to the experimental section, all of us who are going to bore and dap ties through a machine, will find it well worth the extra money to put on an automatic stencil and as the ties pass through, stencil them on the end. I realize, of course, that the value for inspection during the life of the tie will be small on account of the fact that most railroads have the ends of the ties covered nowadays with ballast, but with the date of insertion of the tie recorded on the end, I feel it would well pay for the money spent to stencil the ties, and when they do come out we will know when we put them in.

MR. WATERMAN: I would like to know how many railroads represented here use the dating nail or other marks on every tie they treat or put in the track. That is, is it the practice, or have they abandoned it and are they using it just on experimental sections?

THE PRESIDENT: I would like to ask Mr. Gibson what the results have been on the Great Northern and Northern Pacific. and you might incidentally answer Mr. Waterman's question in that connection.

MR. GIBSON: I don't know very much about the Great Northern, but the Northern Pacific have just been in the tie treating business for three years, and up to the present have been marking the treated ties by putting in a dating nail on every tie treated. The practice, however, I understand, is to be stopped, and sections over the different divisions in the system will have the dating nails placed in the treated ties and the record kept in small sections, such as Mr. Angier described on the Burlington. I believe that is the only way to keep an economical and correct record, because if it is left to the section foremen who go and come every day, they don't care very much whether the nails are in or not, and the results you get are very poor. I don't know that there is anything else I can say on this subject.

THE PRESIDENT: Do you know what experience the Great Northern have had?

MR. GIBSON: I know that they have been in the habit of placing dating nails in treated ties on the Great Northern. Whether they are doing that or not now, I cannot say. They did that for years at their treating plant, and as near as I can find out they still continue the practice.

THE PRESIDENT: I would like to ask Mr. Sterling what the practice is on the Pennsylvania, and what results they obtain on the Pennsylvania with treated ties.

MR. STERLING: Speaking first of untreated ties, it was the practice for a short time to put dating nails in practically all ties, but it was found that this was unnecessary and did not give definite results. The present policy with untreated ties is to use dating nails only on selected stretches of track. When we began treating it was decided to put dating nails in all treated ties, for the first few years, at least, and this has been done up to the present time. In this connection we went a bit further than is customary, and are marking the nails with the species as well as the year; that is, for gum the nail is stamped "G-11"; for red oak, "R-11." etc. That is mainly to save the trouble of cutting the end of the tie to see what it is. After being in the track for some years you know how difficult it is to tell the specie owing to the creosote and accumulation of dirt and cinders.

The point was brought up here as to the life of dating nails, that they corrode and after a long period of years become illegible. That, of course, is true with the ordinary galvanized nail. While in Germany I looked into this question, and in examining ties that had been in track from fifteen to thirty years found that as one looked down at the nail it seemed impossible to tell the year on it, but by getting down and digging out the dirt there were very few cases where the figures could not be read, although most of the nails were badly corroded. On coming back home we arranged, in order to be on the safe side, to have our nails double galvanized. Whether that is going to do any particular good or not, it is too soon to say, but it is our practice at present to have the nails very heavily galvanized and the stamp deep and clear, and I am hoping we will be able after twenty-five or thirty years to read it. (Applause.)

MR. WATERMAN: Who puts the nail in?

MR. STERLING: They are put in as the ties are loaded on the cylinder cars before treatment.

THE PRESIDENT: I believe Mr. Weiss is to give or should give us the benefit of his observations as to the results obtained in prolonging the life of railroad ties in this country.

MR. WEISS: My observations, Mr. President, are gained only very indirectly. I would not be in a position to talk authoritatively on that subject. We are trying, however, to get some authenticated data, and have a number of test tracks that have been and are being laid in various parts of the country. There is one down in Texas, referred to by Mr. Rex; there is one in Alabama, constructed by the Tennessee Coal and Iron Company, in which the ties are treated by various preservatives; one on the Northwestern Railroad near Janesville, Wisconsin; another out in Maywood, Washington, treated and laid in co-operation with the Northern Pacific; but none of these tracks, with the possible exception of the one in Texas, have yielded so far any definite results. So the only information I could give you would be information gained from various firms, which, I believe, has already been dwelt on by the various members of this Association.

MR. DAVIDSON: Mr. Chairman, we have been treating ties about seven years. We started in with the Wellhouse process, used it four years and then commenced to treat with a mixture of zinc chloride and creosote oil. We have been using up to the present time a dating nail, but we hope to change that in the near future. The results have been satisfactory, but seven years is too short a time to get any definite information. The kind of ties that we use are largely made of hemlock and tamarack. Ties made from these two species of wood in our territory did not last over four or five years untreated. The ones treated by the Wellhouse process some years ago are still in the track. We feel very much encouraged, and we hope that those treated by a combination of zinc chloride and creosote will even give us better results than the ties treated by the Wellhouse process. I may say, however, that nearly all of our treated ties are put in dry track in Minnesota, Nebraska and Wyoming. Fortunately a large portion of our line runs through the woods, where ties are cheap, and in that part of the country we use local ties that are picked up along the right-of-way, and the ties used in this territory are not treated. We think that a good thing to do, because the ties used in the wooded district can be gotten so readily and the cost of distribution is small: whereas those used in Nebraska and Wyoming the cost of distribution is quite a figure in the ultimate cost.

THE PRESIDENT: If there is no further discussion on this subject we will go to the next topic, which will be a talk by Mr. E. A. Sterling, of the Pennsylvania Railroad, on "Timber Supply in Relation to Wood Preservation."

MR. STERLING: Mr. President and Gentlemen: It is not the fault of our very able and active Secretary that you do not have a written paper from me and thus be saved from listening to an extemporaneous talk, and really I don't know what the title is. Since Mr. Angier asked me to say something about what railroads are doing in forestry I can perhaps outline that first, but I would hesitate about writing a paper on the subject, because, to be perfectly frank, the railroads have done very little, and if I said what I really thought, it might not be interesting or complimentary to some of us.

To briefly review the situation, the forestry propaganda in this country started on a very unstable basis, namely, saving the individual trees, and that immediately led to planting trees. As soon as it was realized that the forests were becoming depleted, the first thing that railroads or any one else thought of doing was to plant trees. Therefore we can go back quite a number of years and find results or rather experiments along the planting line.

Confining it entirely to railroads, we find that the Illinois Central, Frisco, Michigan Central, L. & N., Pennsylvania, Boston & Maine, and several other roads indulged in various sporadic attempts to plant trees; in some cases on a large scale, but for the most part only experimentally. Here in the Middle West hardy catalpa was the favorite species; and, as you all know, there has been all sorts of talk about catalpa as a tie proposition. The results up to the present time are not much to the credit of catalpa, and without going into details it is certain that the anticipated results have not been achieved. In the East the Pennsylvania started the black locust boom, which failed to materialize because of the damage by borers.

My feeling about forest planting is simply that it is a mighty good thing to do when a railroad has waste land for which it has no particular use. It is a good object lesson to the farmers, and if the plantations are successful they will net a fair return on the investment and furnish a limited supply of ties and timber some time in the future. The main point, however, is that no amount of planting, whether done this year or within the next ten years, will in any way solve the problem of railroad wood supply or avert the timber crisis which it is all too evident is due. In other words, it would not be possible for the individual railroads to plant enough trees to supply their timber requirements; and even if they could, the critical period of scarcity and high prices would come before any of the trees now planted would reach maturity, unless by some miracle the dreams of the catalpa and eucalyptus enthusiasts should come true.

Aside from the planting, there has been very little done that could be called real forestry. Some of the railroads have now undertaken to preserve the timber lands which they acquired through land grants and otherwise. The Southern Pacific, in northern California and southern Oregon, still have quite large areas of good timber from which they can cut mature trees. The Northern Pacific has been co-operating with the Government for some years with a view of finding how best to handle their Western holdings and provide a source of tie supply at the Eastern end of their lines. Across the border the Canadian Pacific has withdrawn very large forest areas from sale, and while they are not practicing forestry in the true sense, they are trying to keep out fire, and provide at least a reserve timber supply. In the East, the Delaware & Hudson have put about one hundred thousand acres in the Adirondacks under management, have established nurseries and are planting trees in the Adirondacks and on some of the coal lands in Pennsylvania.

On the Pennsylvania Lines East of Pittsburg and Erie, the first forest planting was done in 1902, and a technical forester's office established four years later. Briefly reviewing the work, the planting policy first inaugurated has been continued, but with radical changes in methods and in the species used. The aim is to utilize the Company's waste lands, and the work has been extended until about 4,100,000 trees had been planted up to the fall of 1910. In conjunction with the planting work, a large nursery has been established, in which not only the forest seedlings are grown, but a large amount of ornamental stock for right-of-way and station ground planting. Since the Company holdings include small areas of timber land, these wood lots have been cut over with the view of increasing their productivity and in order to show the local land-owners what can be done with second growth hardwood. Throughout Pennsylvania, white pine and other valuable timbers were taken out years ago, and the forests are now made up largely of second-growth hardwood which has been injured by fire and wasteful cutting. By giving thought to the future, developing a market for various kinds of material, and logging these little areas carefully, it has been demonstrated that a small profit can be made, the basis of a valuable future crop secured, and the land left in much better condition than it was before.

As forest or timber problem now appears to us, after attempting to work it out for the Pennsylvania, the essential step is bigger and broader than any of these things I have mentioned. It is mainly this: That if the the railroads, as the largest wood consuming corporations in the country, taking as they do, about 20 per cent of our total timber output, are to provide against future scarcity and prohibitive prices, and if they wish any assurance of getting good timber fifteen or twenty years hence,. there is evidently only one way to do it, and that is to buy mature timber land in fee. Now, this may seem foolish to some; it would be foolish for some railroads, because it is an individual problem with every road; but generally speaking, I believe that it is the only safe and sound policy which can be followed. The Eastern roads, of course, have considerable supplies ahead, particularly since they have taken up wood preservation and can utilize beech, birch, maple and gum, and various woods which heretofore were of no value. But even with that, the time is soon coming when they must go South for more and more of their supplies, and if they are going to keep on getting ties and lumber in the quantities desired and at reasonable cost, it is certain that they must own their own land and cut their own timber by conservative methods which will give successive crops. It is not only possible, but practical and economical and, while forest management on a long time basis is perhaps still far off in this country, we must eventually come to it as they have in Europe, and by postponing it we clearly invite disaster.

This question of timber supply is a vital one to everyone in charge of commercial or railroad treating plants. The commercial plants, perhaps, are the least interested because in many cases the timber is merely turned over to them for treatment; but some one must furnish this timber, and on the question of supply hinges the life of the plant. The railroads operating their own plants have the bugbear of supplies always with them, yet all that they have done to perpetuate a timber supply could be written on a postage stamp. The Santa Fe, for example, builds a big plant down at Somerville in the loblolly region, and proceeds to turn out four or five million ties a year, or the equivalent. The result will be that the consumption of the Santa Fe plant, together with that of other consumers in the same region, will soon clean out the loblolly pine in the whole Somerville territory, and sooner or later the plant will have to shut down or be moved, or the material freighted for a very long distance.

The Somerville situation is mentioned merely as a typical case, and what applies there would hold true elsewhere, with modifications. Now, why couldn't a railroad like the Santa Fe, or any other road similarly situated, own and manage their own timber lands in the vicinity of their plants? From the Government figures and other statistics which are available, we know that seventy-five to one hundred thousand acres of lobolly pine would produce a million ties per year for all time under conservative management, and probably at less cost than the same ties could be bought in the open market at the rapid advance in prices. Timber land ownership by railroads is an economic proposition which could be worked out in conjunction with their creosoting plants, and the same would be true to a greater or less extent of the larger commercial plants.

In many parts of the South the longleaf pine is the principal species and, owing to its slow growth, it is not as attractive from the standpoint of long-time management as loblolly. In nearly every railroad's territory, however, there are timber lands which could, after a study of the situation, be handled profitably, and if every road big enough and strong enough would look ahead and plan where its supplies are to come from, they would not only save a lot of money, but do a great deal of good to the country as a whole. This problem, of course, is purely commercial in its inception, but in addition to that, we all have some patriotic feeling and appreciate the fact that our virgin timber lands, particularly in the South, will not last indefinitely. The whole conservation movement has a basis and an aim which we as American citizens cannot ignore, and by doing our share toward the conservation of the timber and building up our policy on a commercial foundation, I believe we will be not only helping ourselves as individuals and corporations, but the nation as well. (Applause.)

THE PRESIDENT: If there is no further discussion we will go to the next paper on the program, which will be by Mr. J. T.

Logan, President of the National Lumber & Creosoting Company, Texarkana, Arkansas, entitled "General Review of Timber Treating in This Country with Special Reference to Causes that Have and Are Retarding Its More Universal Adoption."

Mr. Logan then read his paper, as follows:

GENERAL REVIEW OF TIMBER TREATING IN THIS COUNTRY WITH SPECIAL REFERENCE TO THE CAUSES THAT HAVE AND ARE RETARDING ITS MORE UNIVERSAL ADOPTION.

This subject is an interesting and important one, both from commercial and economic standpoints.

The fact that the use of treated timber in this country has increased by leaps and bounds during the last six years is shown by statistics compiled by our Government, with which we are all familiar, as well as by the large number of busy treating plants now in operation, as compared with the relatively small number of thirty in existence in the United States in the year 1904, when I became engaged in the occupation of wood preserving. A wonderful development it has been.

This means that many railroads who only a few years back were using untreated ties and bridge timbers, and thereby advancing their date of grief, by aiding the work of rapid consumption of our forests, are now employing a broader and more economical policy with the above mentioned results. It is apparent, therefore, that the eyes of many who are studying the questions which the welfare of railroad operations involve, are opening to the facts that the utility of wood preserving along the right lines is no longer doubted by the practical and well informed, and that the adoption of wood preserving measures at the same time renders material aid to the vital work of forest conservation now being so commendably prosecuted by our Department of Agriculture.

This praiseworthy awakening on the part of those directly at interest would be less significant as an indication of the future proportions of the wood preserving industry of this country could it be said that all these new converts were only experimenting, or merely grasping at straws, figuratively speaking, in an effort solely to prevent their sinking, when the date of the exhaustion of our forests is announced. The concrete situation, however, is different, and the advance steps referred to, calculated to prolong our forest supply, as well as to yield to the investor handsome and almost immediate returns on the increased outlay for treated timber, have resulted from sound reasoning of comprehensive men at the head of progressive corporations. The theses of the Chanutes, Kruttschnitts, Mudges, and other Nestors of this country, in the great science of wood preservation, which a decade back were viewed somewhat humorously, and referred to by shallow minds as fads of theorists, have come to be accepted as axioms by the intelligent student of economics. The persistent efforts of these far-sighted pioneers are now redounding to the welfare of the less discerning.

On the other hand, however, though the general user of forest products in locations causing exposure to the elements are realizing at a creditable rate the merits of various well established processes of wood preservation, and concede that the increased life afforded by their employment warrants the increased initial cost of treated material, many potent factors are yet militating against its universal adoption, even where logical policies demand it.

These causes serving to retard the more general adoption of timber treating in this country at this time, will probably not be entirely eliminated at any early date. They are of various characters, and each case would require individual analysis to furnish an intelligent exposition.

It must be remembered that men intrusted with the managements of railway properties are endowed with varying degrees of practical knowledge of the questions confronting them, as well as of the requisite qualifications to solve wisely these questions. Some of these men, too, are imbued with ambitions tinged with selfishness which cause them to unconsciously, perhaps, ignore the no longer debatable economic measure of using, under average conditions, properly treated timber, and to continue the reprehensible practice of exerting every effort solely to the end that during their brief regime the expense of operation shall represent the lowest possible percentage of earnings, regardless of the permanent welfare of the property entrusted to their care. By such methods the grappling with future problems created by this false economy is left to the succeeding management. This practice too strongly predominates among many, and operates to the detriment of wood preserving development. There are also managers so unfortunate as to have to work under a hand to mouth policy financially, which calls for the cheapest material, and who would employ the most economical methods, were conditions such as to enable them to adopt that course.

Then again the fact that many of the oldest users, and most ardent advocators of treated material in this country are from time to time changing their standards of treatment, thereby lending the appearance of experimenting to their operations, tends to prolong the doubt in the minds of others of less experience, who have under consideration the problem of what is the logical plan to adopt. This condition is doubtless a retarding factor in the more universal adoption of wood preservation.

Furthermore, though regardless of the foregoing, it cannot be consistently said that the use of treated timber is being alarmingly retarded, the list of woods recognized to be of long life in their natural state, will no doubt for many years play their part in opposition to the wood preservers' argument. It would be unreasonable to expect the universal adoption throughout this country of treated ties and other timbers in the near future, even though every consumer should strongly endorse that policy when conditions render same economical, and their preparedness financially to put same into effect clearly shown. So long as long leaf heart pine ties are available in the extreme South at reasonable comparative cost, redwood ties on the Pacific coast, cedar in a few of the Lake States, Bois D'Arc in southwestern Texas, and the scattering white oak in the Central West, South and East, we may look for their continued use in an untreated state by lines traversing the sections in which they are produced.

Finally, with all due respect to the Wood Preservers' Association, of which I have the honor of being a charter member, and with no disposition to utter one word of unjust criticism upon its worthy and meritorious work, it occurs to me there is little official matter in the proceedings of its conventions calculated to enlighten the user of forest products along practical lines in wood preserving, and to convince him of the merits of legitimate work by proper methods. The most demoralizing and dangerous elements to meritorious wood preserving in existence today are such make-shift concerns as those bearing to our worthy institutions the same relationship which the notorious quacks bear to the medical profession. The public is afforded means of detecting the quack and shunning him, and this Association's mark of condemnation it seems should be placed on "coffee pot" and "paint brush" methods, being exploited by concerns posing under the dignified names of "Creosoting" and "Wood Preserving" companies. One carload of the meretricious bogus product of these "get rich quick" concerns, by its early proven worthlessness can influence hundreds adversely to their own interest, and to that of the legitimate wood preserving industry. Such concerns should be branded as things apart from our profession, and this Association I am convinced should go on record accordingly, and in its practices, and by the roster of its membership live up to such principles.

If our calling is a worthy one, its dignity should be protected by this Association in clear cut terms straight from the shoulder, that the more universal adoption of wood preservation may be less retarded.

THE PRESIDENT: The Program Committee has held, as my paper is along the same line, that I should burden you with it at this time.

President Beuhler then read his paper, as follows:

REVIEW OF DEVELOPMENT IN THE TIMBER TREATING INDUSTRY.

Timber preservation has not been developed from any one process, but from many; it has included the elimination of those not bringing results, the retention and development of those showing results, and the addition of new processes.

The first authentic report on timber preservation was probably that of a special committee appointed by the American Society of Civil Engineers in 1880, which report was published in 1885. This special committee discussed the various processes in use at that time, in great detail, and prepared a number of tables showing the results obtained; and it is interesting to know that a great many of its conclusions are accepted today by those conversant with the subject.

I will not attempt to review in detail the development of all the processes in use in 1880, but will confine this paper to the two basic processes, namely, burnettizing and creosoting, as practically all those in use today are either the developed basic processes or modifications of them.

The burnettizing process was patented by Burnett in 1838. The original mode of application was to steep the timber in an open tank. Burnett, however, soon adopted the "Bethell" method of placing it in closed retorts, thus forming a partial vacuum in order to remove all the air and sap, and then injecting the liquid under pressure.

The Burnett process was introduced in the United States at Lowell, Massachusetts, in 1850, and was there worked by the Bethell method until about 1862. It seems to have been quite generally used in the '50s by a number of railroads, but with indifferent success. In fact, these failures caused its abandonment for a time and the substitution of the old "Kyan" process, or use of chloride of mercury.

The special committee, after a thorough investigation of these failures, reported as follows:

"1. Original imperfections in the 'Bethel' process. The partial vacuum did not properly clear the timber of sap. This has since been improved upon by previously steaming the timber, to liquefy and vaporize the sap, before the vacuum is applied.

"2. It was probably a mistake to select bridge timber for this experiment; imperfectly as the work was done, it would have proved a far greater success if it had been applied to cross-ties.

"3. Operating upon unseasoned timber. As practiced in Europe, burnettizing is exclusively applied to seasoned timber. This being generally imported from a distance, has a chance to dry in transit; or if cut in the vicinity of the works, it is piled up for several months before treatment, or is thoroughly steamed, so that the water may evaporate and make room for the solution. Moreover, it is also well dried before using to prevent the zinc from washing out. As a confirmation of this view it may be mentioned that while the bridge timber did not last well, several sets of switch ties which had been cut about eight months and seasoned, were burnettized at Owego, for the road department of the Erie Railway, and laid in its tracks with the result that nine years afterward they did not show a particle of decay. These ties have been lost sight of since, but your committee has in its possession an oak tie, one of a lot of two carloads, seasoned and burnettized at Owego, which lay in the track at Susquehanna station for seventeen years, and is almost perfectly sound today.

"4. Insufficient pressure. It has been suggested that the pressure ought to have been some 200 pounds per square inch and continued eight hours, instead of four. This might have produced somewhat better results, but it is believed that the last cause, which remains to be mentioned, more fully accounts for the partial want of success.

"5. Undue haste in treatment. In accordance with the usual railroad practice of never ordering materials until they are imperatively required, the timber was not procured until the bridge which it was intended to rebuild was about ready to come down. Then there was great haste; the burnettizing works were hurried up, and the timber went straight from the stump into the cylinder, and from that into the bridge, with very imperfect treatment. A pressure was applied to the operatives, instead of to the cylinder, and as a result the timber was 'put through' without sufficient preparation, some of it hard frozen in winter.

* * * * * * * *

"It has been found, however, both in this country and in Europe, that when zinc solutions are employed, weak enough not to injure the strength of the timber, they are likely to wash out under the action of rains and moisture, and to leave the timber unprotected. This is quite well shown by the ties on the Chicago; Rock Island & Pacific Railroad, which are decayed and exfoliated on the outside."

The following is a summary of the various causes of failure brought out by the special committee:

First—Class of material treated.

Second—Condition of seasoning.

Third—Use immediately after treatment, instead of allowing timber to season.

Fourth—Insufficient pressure.

Fifth—Too much haste and consequent poor work.

Sixth—The leaching out of the salt.

It is along these lines that the burnettizing process has been developed. Engineers today do not advocate the treatment of bridge timbers, nor, in fact, any timbers, with a solution of chloride of zinc, such treatment being confined principally to ties. The value of preliminary seasoning is realized, and at present few ties are treated without it. It is also known that, in order to obtain the best results, it is absolutely necessary to dry zinc-treated timber after treatment.

The writer agrees absolutely with the fifth cause for failure as reported by the special committee, that is, "undue haste, and consequent poor work," which probably has had more to do with failure then and now than any other cause.

It is now realized that the sixth conclusion in the report of the special committee was correct, and profiting by this knowledge the burnettizing method is not condemned, but its use has been restricted. At present only certain timbers are treated with zinc chloride and more care is exercised in the selection of the uses and localities for which it is recommended. The fact that zinc chloride is a good preservative and the cheapest, warrants its continued use, provided discretion is exercised. It would be as foolish to pay the additional cost for creosoting ties in arid countries, as it would be to try to economize by the use of zinc chloride in swampy countries.

The strength of the solution to be used was mentioned in the report of the special committee, and it was concluded that too great a strength caused timber to become brittle. This is true today and a 5 per cent solution is probably the strongest now in use.

The strengths of the solutions vary from 2 to 5 per cent, depending on the character of the timber to be treated; naturally, the denser the timber the denser the solution.

The Bethel process, or creosoting, was invented and brought into use in 1838 by Mr. John Bethell, of England, and in his discussion of the paper by Mr. H. P. Burt, in 1853, he made the following remarks:

"Experiment proved that oil of tar, or creosote, was perhaps the most powerful coagulator of the albumen (of wood), whilst it, at the same time, furnished a waterproof covering for the fiber, and its antiseptic properties prevented putrefaction. If, then, the operation of injection was well performed, there was every reason to anticipate the perfect success of the system. He found that by forcing at least seven pounds of creosote oil into each cubic foot of timber the process was perfect. * * * For railway work seven pounds per cubic foot would suffice, but for marine work it was better not to have less than ten pounds per cubic foot.

"He was inclined to prefer the employment of porous timber; it absorbed the creosote more rapidly—was more perfectly saturated—was cheaper in its first cost and when properly prepared would last longer than heart of oak or any other very solid timber. * * *

"The best timber for use was young, growing wood, thoroughly dried; if it was fresh cut, or had been floated, so as to saturate the pores with water, there was great difficulty in creosoting it. * * *

"Mr. Bethell had experienced so much difficulty in procuring a proper quality of oil of tar that he was compelled to establish manufactories and to distil it to suit his own purposes."

Speaking further of its use and success, the special committee reports that:

"As a protection against marine worms (the Teredo Navalis and Limnoria Terebrans) creosote is the only known preservative, and if there be enough of it injected it is thoroughly efficient. All other substances which have been tried have failed, but the success of creosote has been established by abundant evidence all the world over.

"The English have found ten to twelve pounds to the cubic foot sufficient in their harbors. The Dutch and Belgian engineers use about the same. But the French, relying upon a series of very careful experiments, extending over a series of years, by Mr. A. Forestier, consider that about nineteen pounds to the cubic foot is required in their harbors in order to be quite safe against the teredo. This latter quantity has been used in this country by Mr. J. W. Putman for piles exposed along the Gulf of Mexico, and it seems probable that the higher temperature of the sea water and consequent greater activity of the teredo in the French and our own Southern harbors requires a more thorough impregnation with creosote than in the northerly waters to afford immunity.

"The conditions under which creosoting is done in England differ from those in this country in two important particulars:

"1. The English operate upon seasoned timber, which, as it is chiefly brought from the islands of the Baltic, from Norway and from Sweden, generally reaches them some five or six months after it is cut, and frequently remains stacked up some months more after arrival before it is creosoted. All the English engineers specify that 'the timbers shall be thoroughly dry before being creosoted,' while in this country we have almost invariably operated upon freshly cut timber, full of sap.

"This has led to steaming the timber previous to its injection with creosote (as well as with the metallic salts), in order to vaporize the moisture and make room for the solution. There are several methods of effecting this steaming, covered by a number of patents more or less meritorious, but the committee has included them under the general head of steaming in describing some American experiments.

"It is understood that steaming is now also used abroad, particularly in Germany, even when seasoned timber is injected, it being considered a valuable improvement upon the original process of Mr. Bethell.

"2. Creosote is cheap and abundant in England, while it is comparatively scarce and dear in this country. This, together with the higher price of labor and the longer time required to operate upon freshly cut timber, has made creosoting so much more expensive here than in England that in a majority of cases calculation showed that it was cheaper to let the timber rot and to replace it than to go to the expense of preparing it against decay.

"This condition of affairs brought about a considerable number of inventions and experiments to circumvent the foreign experience and to make a little creosote perform as much as a great deal. None of these can be said to have been successful, and it is one of the anomalies which at first much puzzled your committee that the record of creosoting experience in this country should chiefly consist of failures, while the process is a thorough success in England."

In this short comment on creosoting, the special committee has dealt with all questions of importance, namely:

The quantity of creosote;

The character of the creosote;

The kind of timber to be treated;

The conditions of timber best for treatment;

The best method of seasoning the timber efficiently.

It is by reason of a better understanding of these questions that the art of creosoting has developed. Differences of opinion will be found on all these matters, but nevertheless the art, as a whole, has progressed.

Timber must be protected against decay, attacks of land and water insects, and, for some uses, it must be water-proof. In order to answer properly any of these questions, one must have a thorough understanding of decay, of the characteristics of the insects to be guarded against, of the timber itself, and of the preservative.

In order to answer properly the question in regard to the quantity of creosote to be used, it is necessary to know whether the timber is to be preserved against decay, against mechanical destruction by insects, or whether it is to be water-proofed.

If it is to be protected against decay, the locality in which it is to be used must be known, as well as the climatic conditions.

If timber is to be protected against marine insects, it is necessary to know whether it is to be used in Southern or Northern waters.

If it is to be water-proofed, it is necessary to know for what uses it is intended, and its characteristics.

The cause of decay is now generally understood, and the proper quantity of creosote necessary for its prevention is receiving considerable attention. Owing to the increased cost of creosote oil, and its comparative scarcity in the United States, processes have been developed in the past few years in which small quantities of oil are used, which it is claimed will produce the same results as the larger quantities used in the past.

These processes are now commonly known as the empty-cell processes. The older process is known as the full-cell process, and its advocates claim that in order to preserve timber effectually it is necessary to use enough creosote to fill the cell structures. They also claim that the desire to reduce the cost of preserved timber by the use of smaller quantities of oil has produced certain patented processes the claims for which cannot be fulfilled.

Advocates of the empty-cell process claim that it is only necessary to paint the cell walls to prevent decay, and that, by their special process, it is possible to fill the cell structure completely with oil, and then withdraw most of it. Thus the cell structure is virtually painted with a small quantity of oil.

It is not the writer's intention to go into this controversy, and he will only state that it is known that timber can be preserved by the full-cell process.

All the information we have today as to the value of creosote as a preservative is based on the resistance to decay of timbers which have been treated by the full-cell process, and whether it will be possible to reduce the cost by the use of smaller quantities of oil is still an open question. It will only be answered when sufficient time has elapsed to demonstrate thoroughly its efficiency by actual experience. It is to be hoped, however, that this endeavor to reduce the cost of preserving timber will not lead to false economies, and, consequently to false impressions of a good preservative.

In the protection of timber against marine insects in Southern waters, present experience would indicate the use of at least from eighteen to twenty pounds, and in some timbers as much as twenty-six pounds of creosote oil per cubic foot. If the timber is to be used in Northern waters, from ten to sixteen pounds per cubic foot is advocated, depending on the character of the timber to be treated.

There are certain purposes for which timber is used today, such as the modern wood block pavement, in which that quality which makes creosote a good preservative is of less importance than that which makes it a good water-proofing material.

When creosote was first used in the United States to preserve timber for paving purposes, it was thought that it was only necessary to prevent decay, and specifications were based on experience with creosote in preserving timbers for ties and other purposes. These specifications naturally called for an oil similar to that which had been most effective in such preservation. It was soon found, however, that something more than a preservative was necessary. The timbers absorbed large quantities of water, expanded greatly, and destroyed the surface of the roadway. The natural development was to increase the quantity of oil used; this eliminated the trouble for a number of years, but it was discovered that in a short time the oil disappeared from the timber, absorption again took place, and trouble from expansion and contraction necessarily followed. This led to a study of the creosote itself, not only as a preservative for paving blocks, but also for timber, for it was naturally thought that if it disappeared from paving blocks, it would also disappear from timber. This deeper study into the preservative itself has developed it considerably.

It is now customary to differentiate the oils into those suitable for the preservation of timber, for paving blocks, and, possibly, for the protection of timbers against marine insects.

It is now generally conceded that the higher boiling constituents of the oil are the valuable ones, and whereas formerly high percentages of tar acids and naphthalene were specified, it is now customary to require low percentages of both. In fact, although early specifications called for not less than 10 per cent tar acids and 40 per cent naphthalene, those of today demand not more than 5 per cent of the former and 25 per cent of the latter.

When this oil is to be used for the treatment of paving blocks, the allowable tar acids are cut down to 1 to 2 per cent, and the naphthalene to 10 to 12 per cent, but where the timber is to be protected against marine insects, it is still customary to use oils with large percentages of naphthalene, for experience seems to prove that the best protection is afforded by oils of lower gravity.

Due to the development of creosote oil and its increase in gravity and viscosity, another question of importance was presented to the wood preserver, namely, the characteristics of the timber itself.

It was discovered that oils would penetrate certain timbers more easily than others, thus the timbers could be classified, those in each group having about the same factor of absorption.

Mr. F. J. Angier, formerly Superintendent of Timber Preservation of the Chicago, Burlington & Quincy Railroad, who has made a thorough study of this particular question, divides the timber into three groups, which he classes A, B and C:

Class A absorbing less than 22 per cent in volume;

Class B absorbing between 23 and 30 per cent;

Class C absorbing more than 30 per cent.

In Class A he places such woods as red oak, pin oak, beech and tamarac; in Class B, sweet gum, chestnut, sycamore and poplar; and in Class C, tupelo gum, shortleaf pine, cypress, birch and cottonwood.

Another classification which must be made is that of seasoned and green timbers. There seems to be no difference of opinion at the present time as to the fact that it is best, in all cases, to air-season timber before treatment; but conditions are such that this is not always possible, especially in the case of structural timbers. Almost all railroad ties in use today are being air-seasoned before treatment, but practically no bridge or structural timbers, and conditions are such that probably it will never be possible to air-season such timbers. I understand that more railroads are doing this now. Necessarily, then, some method must be devised to season them artificially. The writer will not attempt to go into the details of all the various methods in use today. Investigation has shown that if timber is to be treated with an oil it should be seasoned in oil, and if it is to be treated by a water solution it should be seasoned in a bath of steam, precaution being taken not to steam it at too high a pressure nor for too long a period, as excessive steaming materially reduces its strength.

I have attempted to bring out the important lines along which the art of timber preservation has developed, and it will be noted that this development has been practically that of the original basic process, namely, burnettizing and creosoting.

Another development, which I wish to review briefly, is that of the modified basic processes, which are, with one exception, a combination of creosote and zinc chloride. The exception is the "Wellhouse" process, which is a combination of zinc chloride, tannin and glue.

There are three processes which use a mixture of zinc chloride and creosote as a preservative, namely, the Rutgers, Allardyce and Card processes.

In the "Rutgers" process these two liquids are injected in a mixed condition, the object being to maintain a uniform mixture by regulating the gravities of the two liquids so that one will remain practically suspended in the other. This method, while still in use to some extent abroad, has very little success in the United States, and I know of no plant now operating under this process.

The "Allardyce" process is a two-action process, the zinc chloride being injected first and then the creosote oil.

In the "Card" process, which is practically new, having only been patented in March, 1906, the creosote is injected, mixed with the zinc chloride, the mixture being maintained under pressure by a centrifugal pump.

These processes, undoubtedly, have considerable merit and will prove successful, providing the zinc chloride penetrates to the heart of the timber and the creosote sufficiently to act as a plug to prevent it from leaching out.

The heartwood of certain timbers seems to resist penetration by creosote alone, although it is susceptible of penetration by zinc chloride. The main objection to the injection of zinc chloride alone is, as stated before, that the uses of timbers so treated are restricted, due to the fact that the zinc, being a soluble salt, soon leaches out. This objection is overcome if the leaching can be prevented, and to do this the creosote oil is injected.

There seems to be little question but that these processes are of more value than straight Burnettizing, but it is never claimed that they are as effective as straight creosoting. Their cost is slightly more than Burnettizing and slightly less than creosoting. For the preservation of railroad ties in properly selected territories they are undoubtedly of great value.

I have endeavored to give a brief history of the development of wood preservation. I have abstained entirely from the use of figures in showing this development, and have attempted to bring out only those phases of the question which to me seemed to be important.

THE PRESIDENT: Is there any discussion on these two papers?

Next is the paper by Mr. Townsley on the subject of "Benefits Derived From Attending the Annual Meetings of the Wood Preservers' Association by Members of the Association."

Mr. Townsley then read his paper, as follows:

BENEFITS DERIVED FROM ATTENDING THE ANNUAL MEETINGS OF THE WOOD PRESERVERS' ASSOCIATION BY MEMBERS OF THE ASSOCIATION.

It is characteristic of men to separate into groups or classes, according to their different occupations or amusements or other interests. It is noticeable that foreigners resident in our cities are apt to live in one quarter of the city and in that quarter they attempt to reproduce, in some degree, the conditions which existed in the fatherland. The same spirit is found in Americans who for any reason leave their native city and go elsewhere to live. They meet people from their own city, who were strangers at home, and they find a bond of interest in the mere fact that they came from the same place. New York City possesses a flourishing Ohio Society, having a large list of members who at one time lived in the Buckeye State.

In all sections of the country and at all times of the year we find people interested in the same line of business, meeting for the purpose of becoming personally acquainted with their competitors (whether friendly or not), for the purpose of discussing topics of general interest, so that all may better understand the conditions affecting their common interests in the various sections of the country, and the good that these people derive from these meetings is in direct proportion to the interest they take in their business; and the knowledge that they carry away from these meetings is in direct ratio to the knowledge that they bring to the meetings.

It is unnecessary for me to even begin to enumerate the different associations with which we are all more or less familiar, and many of which we are members of, but in my opinion there is no association which offers to those who attend its meetings better opportunities for giving and receiving valuable information than the Wood Preservers' Association. The members of this Association are by the very nature of their business scattered over the entire United States, oftentimes located at remote and comparatively small towns, where there is little or no opportunity to come into personal contact at frequent intervals with others in the same business. Each of these operating men is attempting to solve a most intricate and complex problem, oftentimes with inadequate equipment, and all too often without the cordial support of his superior officers. This is especially true in the case of wood preserving plants owned and operated by the railway companies. During my experience in this business I have seen a number of men at different times placed in charge of wood preserving plants, who had had no previous experience—who were like the Indian children—thrown into the water and expected to swim—if they swam it was all right—if they didn't, they were probably no good anyway. It is needless to say here what a foolish system that is. A man in charge of a timber treating plant needs all the information that can be secured. If he is a comparative newcomer in the profession he lacks the personal acquaintance with others at other points, which would, if possessed, justify him in writing for advice. He hesitates to approach in that manner, men of whom he knows nothing; he hesitates to go to his superiors and ask for information, and if he does he is very apt to find that they, too, know nothing of the practical end of the business. He is obliged to begin practically at the beginning of things and work out the solution on the ground, although his neighbor a few hundred miles away has, by reason of longer experience, succeeded in solving some of the problems that perplex the newcomer.

The preservation of timber is important, not only because of the increased life given to it when placed in service, but because of the conservation of our timber resources; but the investment in chemicals and labor cannot possibly begin to show returns within the normal life of untreated timber used under similar conditions; and I question whether there is another department in the railroad service that would be permitted to spend money year after year without the management knowing in the beginning and currently that the very best information and the very best methods and appliances were provided.

In the recent Russian-Japanese War the Japs surprised the civilized world with their methods of organization. This was especially true in their care of the health of their soldiers. The percentage of fatalities from disease was enormously reduced as compared with the percentage in our own army in the war with Spain, due to the fact that the Japs took advantage of the latest and best scientific information to be found anywhere in the world and applied that information in the handling of their armies. The Japs have been accused of being imitators; and so they are, and why should they not be imitators? Within the last fifty years they have come out of barbarism and have taken their place in the front rank of civilized nations. Why should they not have taken the best in the world as they found it, rather than to have gone back to the beginning and worked out each problem for themselves?

Why in the timber treating business should any beginner start at the beginning of things and go over a path that has been worn smooth by scores of others? One of the best ways of exchanging information is by getting together at more or less frequent intervals the men who are engaged in the practical operating end of the timber preserving business, where they may exchange their views as to the most economical or most satisfactory methods of handling labor, or the mechanical appliances required in the operation of a plant, or where they may discuss the peculiarities of the various kinds of timber, or discuss the effect of seasoning or time of cutting on timber intended for use under varying conditions.

There is no fixed law which governs the application of any treatment. The method must be varied according to its own peculiarities, these conditions varying according to the conditions under which the timber is cut or seasoned, or the method may vary according to the conditions under which it is to be used. There is no universal rule which can be applied, which emphasizes the importance and the absolute necessity of an interchange of information. This interchange can best occur by coming in personal contact and the profits to be gained by the railroads or other corporations spending tens or hundreds of thousands of dollars year after year are so great that there is no employer today who can afford not to send his operating men to such conventions as these. In fact, they should take a stand which is directly contrary to the usual position and should direct their operating men to go to these conventions, providing them with an expense account, and giving them the necessary time and transportation.

Mistakes have been made and are being made and will be made in the application of preservative methods—not due to carelessness, but simply due to a lack of experience. Can you conceive of the possibility of a railroad authorizing the construction of a new line, paying out money year after year for the completed work and waiting until the investment is complete before taking positive steps to know that the road could be operated—that the grades would permit them to haul the required loads? It is an absurd idea. Would the engineering staff of a railroad be permitted to build a bridge without figuring every possible stress or strain—without making borings for the foundations; without knowing for a certainty that the factor of safety was great enough to guard against disaster? They would not. In these two cases, that of building a railroad or designing a bridge, the engineering staff is dealing with factors practically all of which can be accurately estimated. The question of grades is simply one to be worked out in locating the line. It may require a detour to reduce the grade—it may require a tunnel to reduce the grade. Either the additional mileage or the tunnel through a mountain can be provided by the expenditure of money. In the case of the bridge builder his task is one of precision—he knows beforehand what the result is going to be. His calculations are checked and counterchecked. The stresses and strains are most carefully estimated and a full allowance made for emergencies. In the case of a timber treating plant the operator is all too often told to go and run the plant, turn out so many ties a day or so many feet of piling—put in so much of this or that and let it go at that.

If the normal life of untreated timber is reckoned at five years and the expectancy under satisfactory treatment may be reckoned at ten years, would it not be wise to take every precaution to see that the life of the treated timber exceeded ten yars, if possible, rather than to hamper the operating staff and run the risk of the treatment failing, thereby bringing the particular process used into disrepute or bringing censure on the head of the man who applied it, or perhaps creating in the mind of the management the idea that all treatment was bad. It is axiomatic that no man can know too much about his own particular business; that he cannot too thoroughly understand the details, the variations and the methods; that the more he knows the better able he is to cope with varying conditions, and there is no business where there is a greater variation than in the business that brings us together at this time.

If these things could be brought forcibly home to the management in charge, believe there is not a man directly interested in the operation of a plant or in the exploitation of the wood preserving business, who would not be instructed to report at the Annual Convention of the Wood Preservers' Association as a matter of duty.

SECRETARY ANGIER: Mr. President, Mr. Townsley's paper brings out some excellent suggestions. It reminds me of the foremen's meetings which were started at the Galesburg plant of the C., B. & Q. Railroad in November, 1909. At first these meetings were held every week, but later every two weeks. The object of these meetings, as stated by the superintendent, was as follows:

"It is hoped to bring up and discuss such matters as will be of mutual benefit to all, and thereby promote harmony among the men and economy in operation. If each foreman can get an idea of what the other foremen are expected to do, through the medium of these meetings, he may line up his forces in such manner that his department will co-operate with the other departments, which will aid very materially in the operation of the plant. It will bring the foremen in touch with each other, so that in case of sickness or absence of a foreman for any reason the work will not be handicapped or delayed for lack of a competent party to take charge of his department. It will teach each foreman to understand why it is necessary for him to watch details of his work which might otherwise be overlooked and seriously affect the operation by throwing another department into confusion. Details which one foreman might consider unnecessary would be brought up and discussed, and may prove to be of the utmost importance to another part of the plant. The work would be elevated to a higher standard on account of each one knowing why he must do certain things, which he might think is a decided waste of time on his part, not knowing what it actually means to the operation of the plant as a whole after it leaves his hands.

"Questions will be taken up and discussed, and each foreman is requested to give his views on same with any suggestions he may have. It is possible that a foreman in one department may be able to give a foreman in another department a suggestion which he has not thought of himself, and thereby save him time and make his work easier and more pleasant.

"Improvements will be suggested and put into effect. Misunderstandings which are fatal to the efficient operation of the plant will be overcome and adjusted."

Here are a few of the subjects discussed at these meetings:

Proper marking of ties piled in yard, so they can be readily separated for treatment, as distinguishing between the different kinds of woods and first and second class ties.

Classification of timber for treatment, showing the absorptive properties of the different kinds of wood.

The bad effect of permitting dirt, cinders, stones and other material adhering to ties during the treatment in the cylinders.

Piling ties in yard with sapwood up instead of down.

Treatment of No. 1 and No. 2 ties.

The use of treated timber to pile ties on in the seasoning yard. Untreated timber in contact with the ground decays rapidly, and in the case of ties many are destroyed by decay before the upper ties can be removed.

Injury done by freezing, especially with timber treated with a water soluble salt.

Method of keeping a proper check of ties loaded and unloaded from tram cars.

Determining the cubical contents of irregular forms of ties.

Use of "S" irons to prevent ties splitting and cracking while seasoning.

Ect., etc., etc.

Meeting adjourned till 10 o'clock, January 19, 1911.

THURSDAY MORNING SESSION.

January 19, 1911.

Meeting was called to order by the President.

THE PRESIDENT: We will take up the regular program this morning. The first paper will be by Mr. C. D. Chanute, of O. Chanute & Company, on "What Per Cent of Creosote Oil Can Be Withdrawn by Subsequent Vacuum?"

Mr. Chanute then read his paper, as follows:

"WHAT PER CENT OF CREOSOTE OIL CAN BE WITHDRAWN FROM WOOD BY SUBSEQUENT VACUUM?"

This subject having been assigned to him, the writer thought that the best way to check the experiments made and discussed last year would be to make some experiments, more on the order of laboratory tests rather than on the commercial order, so the following set of experiments were evolved, and which are submitted without comment:

Some thoroughly dried ties were weighed carefully and then put in the cylinder, and the door tightly closed. The cylinder had a capacity of three ties, and on top of the cylinder at the highest end (as the cylinder was on a slight slant), there was connected a small pipe extending about a foot above the cylinder, so that when filling, the fact that the cylinder was absolutely filled could be ascertained, as the creosote was allowed to flow into the cylinder until it came out of this pipe in a solid, liquid stream, thus showing that there was no foam or air left in the cylinder, after which the valve just above the top of the cylinder was closed.

The cylinder was filled entirely by gravity, no vacuum being produced before filling, and the creosote was allowed to enter the cylinder very gradually so as to produce as little foam as possible. There was also a small pipe connected with the bottom of the cylinder at the lowest point, which was used to catch all drippings, as the cylinder was on a slight slant, as before mentioned.

After filling, a pressure of 100 pounds per square inch was applied for three hours, and steam circulated in the steam coil, keeping the temperature at 180° F. The creosote was then withdrawn as completely as possible, and the ties immediately taken out and weighed, being set in tin troughs on the scales which would catch all drippings, and then allowed to stand in the air for one hour, still in the tin trough, after which the ties were reweighed, and the drippings in the troughs and the drippings from the cylinder after the ties were removed, were weighed, so as to check the drippings of the ties. In all cases this checked very closely. The ties were then returned to the cylinder and heated to the same temperature as before removal, and a vacuum of 25 inches applied for one hour, and this vacuum was obtained in about three minutes, due to the small capacity of the cylinder.

After this vacuum, air was admitted to the cylinder, and the oil extracted allowed to run through the small pipe under the cylinder, caught and weighed. The ties were removed from the cylinder and weighed, being again set in the tin troughs which had been cleaned of the former drippings. The drippings from the cylinder, and the drippings in the troughs, were weighed to check the weight of the ties after the vacuum, and the following results were obtained: (See table, page 165.)

* * * * *

The writer performed some experiments along this line about 15 years ago, that is, the extraction by vacuum, and obtain about the same results, which seem to show that from 5 to 15 per cent can be extracted by subsequent vacuum.

EXPERIMENT "A"

Tie No.	Species.	Tie.	WEIGHT.			After Drying in Air 1 Hr. Pounds.	Lost by Dripping Pounds.	Weight After Vacuum Pounds.	Extracted by Vacuum Pounds.	Per Cent Extracted by Dripping.	Per Cent Extracted by Vacuum.	Total Per Cent Extracted.
			Before Pounds.	After Pounds.	Absorbed Pounds.							
1	Red Oak	Hewn	126.	162.	36.	160.	2.	156.	4.	5.5	11.1	16.6
2	Black Oak	Hewn	109.5	130.5	21.	129.5	1.	128.	1.5	4.8	7.1	11.9
3	Red Oak	Hewn	132.5	171.	38.5	168.	3.	163.5	4.5	7.8	11.6	19.4
4	Sycamore	Hewn	89.	145.	56.	144.	1.	139.	5.	1.8	8.9	10.7
5	Beech	Sawed	104.	145.	41.	144.5	0.5	139.5	5.	1.2	12.2	13.4
6	Sycamore	Hewn	94.	159.	65.	157.	2.	151.	6.	3.1	9.2	12.3
7	Loblolly Pine	Planed	84.	102.5	18.5	102.	0.5	101.	1.	2.7	5.4	8.1
8	Loblolly Pine	Sawed	83.	130.	47.	129.	1.	124.	5.	2.1	10.6	12.7
9	Loblolly Pine	Sawed	67.	125.	58.	120.	5.	112.	8.	8.6	13.8	22.4
10	Poplar	Hewn	70.	107.	37.	106.	1.	103.5	2.5	2.7	6.7	9.4
11	Rock Elm	Hewn	118.	177.	59.	174.	3.	168.5	5.5	5.1	9.3	14.4
12	Red Gum	Hewn	80.	112.	32.	110.5	1.5	105.5	5.0	4.7	15.6	20.3

REMARKS: Creosote—1.055 Sp. Gr.
Temperature during pressure 180° F
Pressure—100 lbs. for 3 hours.
Vacuum—25 inches for 1 hour.

THE PRESIDENT: This paper is now open for discussion. If there is no discussion, we will proceed with the next paper on the program, which is entitled "Asphaltic Oils as Applied to the Preservation of Railroad Ties," by F. W. Cherrington of the Indian Refining Company, Cincinnati, O.

Mr. Cherrington then read his paper, as follows:

ASPHALTIC OILS AS APPLIED TO THE PRESERVATION OF RAILWAY TIES.

The results obtained in the Asphaltic Crude Oil treatment of railway ties by the Santa Fe Railroad and the Mexican National Railways have proven the fact that water-proofing asphaltic crude oils have a claim for serious consideration as successful wood preservatives.

As early as 1885 a report was made by the Committee on Wood Preservation of the American Railway Engineering and Maintenance of Way Association, which concluded with the statement that crude petoleum would prove a preservative so long as it would continue to saturate the wood by the exclusion of water, but that if injected once and for all its volatile nature would result in its evaporating and leaving the timber unprotected. This report was made after a thorough investigation of the eastern crude paraffin petroleum, which had continually dripped on the railroad bed in the oil-producing region and prolonged the life of the ties in the tracks. These paraffin oils are not stable in their composition, being susceptible to the disintegrating influence of the action of the elements, and therefore, in order to secure results by the exclusion of water, a continual application of fresh oils became necessary.

About fifteen years later the Santa Fe Railroad injected Bakersfield, California, asphaltic crude oil into pine ties and laid them in a section of track in southern Texas, where the climatic condition is one of the most severe for ties to be found in North America. A maximum quantity of oil was forced into these pine ties, the absorption per tie being, of course, dependent upon the amount of heart and sap wood in each tie.

An investigation of the asphaltic crude oils located in sections of the country other than California or Mexico discloses the fact that in their natural condition the crude asphaltic oils foreign to these two localities are too volatile, highly inflammable and not sufficiently viscous to prove of value as a wood preservative; therefore, it is necessary to refine oils having an asphaltic base, in other localities, thereby securing preservative oils which are similar and in some instances superior to the western asphaltic oils.

In the attached table No. 1 may be found a complete analysis of three asphaltic oils, viz., the Western Bakersfield (Cal.) Asphaltic Crude Oil, now in use by the Santa Fe Railroad at Albuquerque, N. M.; the Mexican Ebano Asphaltic Oil; and finally, the refined product of an asphaltic crude oil found in the central United States. All of these oils are obtainable in large quantities and at low cost. The analysis of the refined asphaltic oil obtainable from the central United States is presented as a representative of what may be accomplished by refining the asphaltic crude oil of the east, and thereby securing an asphaltic residual oil which is practically non-volatile, non-inflammable, and at the same time not nearly so viscous or hard to handle by the average plant equipment as the California crude product or the Mexican Ebano oil.

The following discussion of the "Analysis of a Residual Oil," which had been refined from an asphaltic base crude oil taken from the central United States, has recently been submitted as the first progress report of the Government Forest Products Laboratory, at Madison, Wis., the object of which is to determine the value of this residual oil as a wood preservative:

"The distillation data show that the fraction from this oil have rather high boiling points, comparing in this respect very favorably with good coal-tar creosotes. The index of refraction values of the fractions lie in a range generally assigned to crude oils. These observations would be expected of an oil which, according to the manufacturer's description, is a residue left on distilling off the lighter fractions from the crude oil.

"Both the flash and burning points are high. This is a desirable property from the standpoint of fire risk.

"The viscosity curve represents from the wood preservation viewpoint undesirable properties, as it is found necessary to heat the oil to 80° C. before readings could be obtained on the viscosimeter. It is, therefore, more difficult to circulate this material through pumps or pipes than coal-tar creosote."

The last paragraph of this report has been found to be true in actual tests, as creosote is naturally easier to handle in pumps and pipes than the more viscous asphaltic oils. In actual practice, however, at the several tests on plants of standard equipment, the pumps and valves were not affected to any appreciable degree by the viscosity of the oil.

During the month of April, 1910, various tests were made at the C., B. & Q. experimental plant at Galesburg, Ill., by a representative of an eastern refining company in order to thoroughly investigate the properties of this refined grade of an asphaltic crude oil as a wood preservative. Tests were run to determine whether this more economical oil could be used as a substitute for creosote oil in the Card process. In this test a mixture of 23% asphaltic oil and 77% of a 5-per-cent zinc chloride solution was used. The results from this experiment proved that asphaltic oils could not be used in the Card process, because of the formation of a viscous emulsion, or saponification, which permitted the zinc chloride to penetrate the wood in large quantities, but prevented the entrance of the asphaltic oil into the wood. The fact that the zinc solution separated from the emulsion and penetrated the wood, leaving a thick mass of oil and emulsion distributed either irregularly through the wood or on the exterior of the timber, proved the futility of trying this process further, especially as the mixture was exceedingly hard to handle in the pumps and valves.

After determining the fact that the asphaltic residual oil could not be successfully used in the Card process, additional test runs were made to determine with what degree of success the straight asphaltic oils could be injected into the wood, and finally a mixture of 75% of asphaltic oil to 25% of creosote was used.

The experiments at Galesburg demonstrated that fairly good penetration could be secured on the various oaks, elm, beech, gum, etc., ties when injecting all the preservative the ties would absorb. This maximum amount was found to be about 7 lbs, per cubic foot. Pine ties (short leaf) were found to readily absorb the straight asphaltic oil in good quantities with thorough penetration.

The treatment with 25% creosote to 75% asphaltic oil proved that the viscosity of the oil was greatly reduced by the addition of creosote, and about the same pentration and absorption could be obtained as with straight creosote with a greatly reduced cost of treatment.

In order to determine whether the same proportion of 25% creosote to 75% asphaltic oil existed in the tie after its injection, a sample of the borings extracted from several ties injected with this mixture was taken and analyzed by a competent chemist, which proved that the mixture remained in a stable and homogeneous combination. The analysis secured from the boring extractions from the treated ties was ultimately compared with the analysis of the mixture remaining at the end of the test and the original creosote oil. The boring samples were analyzed for specific gravity, moisture content and amount of tar acids present. Finally, a fractional distillation of each of the three samples was made, taking the fractions in each case at the same temperature and determining the percentage, specific gravity and refraction of each. The results are tabulated in Table No. 2 (page 173).

From the results secured in the comparative analyses of the oil extracted from the borings of the treated ties, the original creosote oil and the original mixture of 25% creosote to 75% asphaltic residual oil, it is safe to state that the mixture found in the treated ties approached the original proportions, and that the mixture injected into the ties contained about the same proportion as the original mixture before injection; hence, the mixture of creosote and asphaltic residual oil obtained from the central United States remained in homogeneous solution before, during and after its injection into the wood.

In the fall of 1909 the refining company shipped a large tank car of heavy asphaltic residual oil to the low pressure plant of the Indianapolis, Columbus & Southern Traction Company, at Columbus, Ind. At that time a co-operative agreement was entered into between the refining company to furnish the oil, the traction company to furnish the plant and ties, and the Forest Service of the United States Government to supervise the tests and to record the experimental data. This initial test at Columbus, Ind., proved a failure, because of the inability of the small capacity pressure pump at the treating plant to handle the thick, viscous asphaltic residual oil, which was at that time a grade very much heavier than the product which has eventually been adopted by the refining company as a more satisfactory material. Before this test was completed, however, it was found that the asphaltic oil resisted the forcing of zinc chloride solution through an injection of 3 lbs. of asphatic oil per cubic foot to a very much greater degree than the same quantity of creosote. This proved the superior waterproofing quality of the asphaltic oil, as it is safe to assume that a material which would resist the forcing of a water solution through such a limited injection of 3 lbs. per cubic foot would successfully resist the action of water even under abnormal conditions to which treated material is generally subjected.

One other test, made at the laboratory of the above mentioned refiner, may prove of interest in showing the additional waterproofing quality of the asphaltic oil. A paving block of standard size was treated with residual asphaltic oil to the amount of 16 lbs. per cubic foot. It was then dried in an oven of a temperature of 120° F. for a period of twenty-four hours, weighed, and then immersed in clear water for a period of twenty-four hours. The gain in weight was found to be .02 of one per cent. The same block, if treated with 20 lbs. per cubic foot of creosote, would have been allowed to absorb as high as 3% or 4% of the water, by weight.

The most recent test on asphaltic oils occurred in November, 1910, when several tank cars of asphaltic residual oil were shipped to the Mount Union plant of the Pennsylvania Railroad Company for a trial in the large cylinder at that plant. At this test, three charges were run with straight asphaltic oil, and three with a mixture of 33 1/3% creosote to 66 2/3% asphaltic oil. When this proportion of asphaltic oil and creosote was exhausted, more creosote oil was added as required until the proportion again assumed 100% creosote. Each charge averaged about 500 ties of 7x9x8½ dimensions.

Sections sawed out of the center of the pine ties showed complete penetration through the sapwood to the heart, this being an equivalent penetration to that secured by the use of creosote.

It was found that red oak, beech, elm and gum ties varied in the penetration secured, being dependent upon the amount of sap and heart wood in each tie. The penetration was not equivalent to that secured by creosote in all cases, but approached very nearly the results secured through the use of creosote. When the difference in viscosity between the two oils is considered, this result is not remarkable.

In each of the straight asphaltic runs eight ties were marked and weighed before treatment, being selected as average samples from among the 500 ties composing each charge, and placed in various positions in the cylinder. After the process of treatment had been completed, the ties were again weighed and the absorption results of two charges with straight asphaltic oil are given in Table No. 3 (page 174).

Reference to Table No. 3 proves that the absorption per tie in the various woods was not excessive, at the same time giving good penetration in almost all cases. Therefore, considering the fact that the asphaltic oil was not absorbed in large quantities when the woods were given a maximum treatment and again giving a penetration comparing favorably with that secured by the use of creosote, asphaltic residual oils may be considered an economical substitute for creosote.

The results secured on the mixture of creosote and asphaltic oils proved, in every instance, as far as absorption per tie and the element of time for treatment may be concerned, equivalent to the results secured by the use of straight creosote oil. It must be admitted, however, that the asphaltic oils when used alone require a larger period of time for injecting an equivalent quantity of creosote, which quantity has been observed to be, in most cases, on hard woods, the maximum quantity.

Following these tests in the large cylinder, tests were made in the experimental cylinder on the Rueping process in the treatment of mixed oak and pine ties with straight asphaltic oil. The absorption obtained in the limited number of tests made on the Rueping process were very satisfactory, as the same penetration was secured by a limited quantity of oil as was secured by a larger quantity of oil in the straight asphaltic oil pressure process. This experimental test merely proved the applicability of asphaltic oils for use on a large scale in the Rueping process, although it is readily admitted that there are no long time practical tests to emphasize the theoretical deduction that the treatment would be a good one. It is also readily admitted that the only value of asphaltic oil, obtained from the central United States, as a wood preservative would be in using a parallel treatment to that in which the Santa Fe Railroad have obtained such excellent results, viz., the injection of maximum quantity of oil into the wood. The only object in citing the experiment on the Rueping process is to show that the asphaltic oils are at least applicable.

As the distillation data in Table No. 1 demonstrates that the fractions of asphaltic residual oil possess high boiling points, comparing in this respect very favorably with good coal-tar creosote, and at the same time comparing favorably with the analysis of the Bakersfield oil, it seems reasonable to assume that it has great value as a wood preservative.

It has been claimed that if the asphaltic oils were injected in maximum quantities into the various species of red oak, beech, elm, gum, etc., the quantity which would be absorbed per tie would be so great that there could be no economy in its use. The attached data and the cross section samples taken from the ties in the several tests made on these species of wood with asphaltic residual oil prove that this is not the case. Good penetration has been secured by not over an 8 lb. per cubic foot injection of asphaltic oil, which also proved to be the average amount the various timbers would absorb.

This proves the case with all except the short-leaf pine ties. and even with that species the amount of oil necessary to secure a maximum injection was not found to be prohibitive from the standpoint of economy.

The Santa Fe Railroad and the National Lines of Mexico have demonstrated by a practical test, under abnormal conditions of about nine years' duration, the value of asphaltic oils when injected into pine ties to refusal. Some of the ties which successfully withstood this test contained a small amount of oil, yet it was in all cases the maximum quantity which the ties would absorb.

The foregoing data is the result of observations and experiments extending over several years with the asphaltic base oil to be found in such immense quantities throughout the central part of the United States.

TABLE NO. 1

COMPARATIVE TESTS MADE BY A. T. & S. F. RAILWAY ON BAKERSFIELD, CALIFORNIA, ASPHALTIC CRUDE OIL, SUCH AS IS BEING USED FOR TREATING BY THE SANTA FE PLANT AT ALBUQUERQUE, N. M., AND THE INDIAN REFINING CO. ON TIMBERASPHALT.

	Mexico Ebana	California Bakersfield	Central U. S. Timberasphalt
Flashes in closed tester at °F	176.	256.	410.
Flashes in open tester at °F	190.	268.	470.
Degrees Beaums' at 60 °F	12.1	11.9	19.2
Specific Gravity at 60 °F	.9849	.9867	.9388
Distilling Tests using a retort (Percent coming over)			
0°C to 100°C percent		......	......
100°C to 150°C percent	1.0	......	......
150°C to 300°C percent	20.1	15.0...	......
Distilling Tests using flash thermometer opposite takeoff			
0°C to 100°C percent		......	......
100°C to 150°C percent	1.1	......	......
150°C to 300°C percent	22.6	16.0	23.5
Evaporation tests, placed in open dishes in air oven at 140°F—Oil 1.4″ deep			
In 24 hours, percent	6.8	2.3	......
In 96 hours, percent	9.4	4.6	......
Evaporation tests, placed in open dishes in air oven at 200°F—Oil 1″ deep			
In 24 hours, percent	9.8	4.8	.033
In 96 hours, percent	11.4	11.5	.132

Fractional Distillation (Standard method)

	Creosote	California Bakersfield	Central U. S. Timberasphalt	
Spec. Grav. at 38°C..	1.04	0.965		.928
Below 210°	not more than 5%	0.50	water	.333
210°—235°	not more than 25%	0.60	naphtha and water	.50
235°—270°		1.50	light oil	34.166
270°—315°		6.70	gasoline	34.166
315°—355°		14.50	kerosene	34.166
Residue		75.00	asphaltum	65.00
Spec. Grav. of Residuum at 38°C		0.99		

NOTE.—Bakersfield oil has been exposed in an open pan for one year and so far has shown practically no loss by evaporation.

Viscosity Tests.

Using Scott's viscosimeter in which 200 C. C. oil is put in the viscosimeter and the number of seconds required to pass 50 C. C. through a small artifice is recorded. The Standard for this machine is 11 seconds for 50 C. C. distilled water at 60°F.

Oil Heated to	Mexican Ebano	California Bakersfield	Timberasphalt	Creosote
100°F	3,000.	1,565.	595.	18.
150°F	339.	238.	115.	16.
200°F	110.	44.5	32.	15.
220°F	70.	31.5	23.	11.
250°F	40.5	22.	20.	11.

TABLE NO. 2

OIL EXTRACTED FROM BORINGS.

Specific Gravity at 60°F	.99416
Water	none
Tar Acids	1.5%

DISTILLATION.

	Amt. %	Spec. Grav.	Ref.
190° to 220°C	2.0	1.012	1.558
225°C	2.3	1.020	1.567
230°C	1.8	1.022	1.573
240°C	2.5	1.029	1.578
250°C	2.2	1.019	1.571
260°C	2.6	.9987	1.541
270°C	3.2	.9788	1.511
285°C	3.8	.9524	1.487
300°C	3.5	.9413	1.476
315°C	2.0	.9318	1.472
330°C	5.7	.9467	1.474
345°C	5.2	.9416	1.479
360°C	40.5	.9409	1.483
Res.	22.1		

SAMPLE MARKED "ORIGINAL CREOSOTE OIL."

Specific Gravity at 60°F	1.049
Water	1.0%
Tar Acids	6.7%

DISTILLATION.

	Amt. %	Spec. Grav.	Ref.
170° to 220°C	12.16	1.017	1.568
225°C	9.24	1.024	1.594
230°C	6.96	1.029	1.612
240°C	10.08	1.038	1.617
250°C	8.76	1.049	1.621
260°C	6.32	1.066	1.630
270°C	4.56	1.078	1.637
285°C	5.20	1.083	1.644
300°C	5.52	1.096	1.650
315°C	5.32	1.108	1.652
330°C	6.24	1.117	1.659
345°C	6.76	1.121	1.662
360°C	3.60	1.130	1.664
Res.	8.40		

SAMPLE MARKED "RUN 167—END—MIDDLE."

Specific Gravity at 60°F	.9908
Water	18.6%
Tar Acids	1.8%

DISTILLATION.

	Amt. %	Spec. Grav.	Ref.
170° to 220°C	2.4	1.009	1.551
225°C	3.0	1.018	1.563
230°C	2.2	1.026	1.568
240°C	2.0	1.034	1.572
250°C	3.4	1.019	1.566
260°C	3.1	.9996	1.546
270°C	3.5	.9891	1.522
285°C	4.4	.9769	1.486
300°C	5.0	.9655	1.471
315°C	4.2	.9567	1.475
330°C	4.5	.9432	1.473
345°C	4.1	.9429	1.477
360°C	38.9	.9411	1.489
Res.	19.0		

TABLE NO. 3

WEIGHT OF TIES BEFORE AND AFTER TREATMENT—MOUNT UNION TEST ON TIMBERASPHALT—FOR PENNSYLVANIA RAILROAD.

RUN NO. 915.

Specie	Before Lbs.	After Lbs.	Pounds absorbed per tie	Gallons absorbed per tie	Lbs. per Cu. Ft.
Hardwood Special	212½	224	11.5	1.46	3.48
Sap Pine	210	234	24.0	3.045	7.27
Sap Pine	146	156	10.0	1.269	3.00
Seasoned LL Pine	180	211½	31.5	4.00	9.54
Birch	149	157	8.0	1.015	2.42
Gum	134	164	30.0	3.807	9.1
Red Oak	163	191½	28.5	3.61	8.66
Beech	180	198	18.0	2.284	5.45

RUN NO. 916.

Specie	Before Lbs.	After Lbs.	Pounds absorbed per tie	Gallons absorbed per tie	Lbs. per Cu. Ft.
Seasoned Elm	148	178	30.0	3.807	9.1
Seasoned Birch	163	178	15.0	1.903	4.53
Seasoned S. Elm	168	221	53.0	6.72	16.06
Seasoned Gum	196	247	51.0	6.4	15.45
Seasoned M. Oak	136	152	16.0	2.03	4.83
Seasoned Pa. Pine	103	135	32.0	4.06	9.7
Green Y. Pine	125	152	27.0	3.42	8.18
Hardwood Special	212	230	18.0	2.2	5.45
Seasoned Beech	189	220	31.0	3.93	9.4

(Mr. Allerton took the chair.)

CHAIRMAN ALLERTON: Gentlemen, you have all heard Mr. Cherrington's paper, and it is now open for discussion. I hope that we will hear the views of a great many now present on that subject, because it is something that is bound to come, and the time is not far distant when the asphaltic base oils of low viscosity will have to be taken into consideration. We are using now a mixture of tar with our oil. That is supposed to be a grand good thing; the grand good thing is the men that have been induced to use it; it is the age-old and time-honored practice of stretching. We know that a small amount of creosote is equal to a very large amount if it is put in the proper place in wood, and by using asphaltic base oil of low or of equal viscosity with the creosote we can have a full-cell process as cheap as any other process, and can fill the cells or capillaries of the wood thoroughly and have a thorough treatment and obtain lasting qualities in the wood.

I want this subject to be thoroughly discussed. I am going to call on different members. First, I want to call on Mr. Rex.

MR. REX: Mr. Chairman, as you all know, the Santa Fe Railroad has been experimenting with asphaltic oils in the preservation of timber since early in 1901. Mr Faulkner and Mr. Powers at that time took up the experimenting with oil treatment and started with California crude oil. Records of these tests, of course, you all have seen time and time again, from the experimental track in east Texas. Since that time we, of course, have been investigating other sources of oil of the same character, on account of the extremely long haul of the California oil, which makes it almost prohibitive to use in the central west, and since that time we have been experimenting with practically every crude oil produced, except Indiana oil. We have not had any experience with Indiana oil, but almost every other oil in this country we have experimented with. There are no results as yet, because the time has not been sufficient to justify conclusions. but a report of the experiments has been very ably presented in a paper by Mr. Faulkner, published in the Railway Age Gazette, and no doubt all of you have seen the paper and read the article. Since that time we have drawn no conclusions that would justify me in making additional remarks that would be of interest in crude oil treatment.

MR. BURKHALTER: Mr. Faulkner had a paper in the Railway Gazette. Was that the same paper?

MR. REX: Yes; I believe it was republished.

CHAIRMAN ALLERTON: Mr. Burkhalter, we would like to hear from you.

MR. BURKHALTER: Well, I feel, after a sweeping and comprehensive report like that of Mr. Faulkner's which has been published, I haven't anything to add. The only thing I would suggest, if anybody wanted to see what had been done in the crude oil field, would be to obtain a copy of that paper. It is a long and comprehensive thing, and it submits the entire results so far obtained by the Santa Fe road, giving all the figures, and I hardly think I could add to it. The date of it was the 19th of August.

MR. CARD: How does the cost of this oil compare with the cost of creosote in this part of the country?

MR. CHERRINGTON: The cost of asphaltic residual oil is about three cents per gallon f. o. b. the refineries.

CHAIRMAN ALLERTON: We would like to hear from some one else. I know there are a great many present who have opinions on this subject, and I would like to have them express them. When I have the opportunity I am not afraid to say what I think; generally do. Mr. Weiss, we would like to hear from you.

MR. WEISS: Mr. Chairman, we have been having under consideration for some time the testing of oils, which are considered to be of importance only on account of their water-proofing properties, and in order to get some basis on which to work I have had a line of posts set in the ground. I asked a number of pathologists in this country how much water is necessary in timber in order to start it to rot, and none of them seem to have any specific information. We all know, for example, that telegraph poles set in our northern states don't rot at the top; the decay takes place at the ground line. It is not because the top of the pole is not subject to attacks of fungi, but it is because there is enough moisture at the butt of the pole to enable them to live. The posts that I refer to have only been in the ground about two months, and when originally set they had about 16 per cent of moisture as determined by borings at three different points. At the end of the first month the per cent of moisture in the tops of the posts was about 16 per cent; it had not fluctuated. Right at the ground line there was about 20 per cent, and just below the ground line there was about 22 per cent. A few weeks after that I had borings taken again, and found that the moisture in the top was practically the same, about 18 per cent; that the ground line had increased to 30 per cent, and just below the ground line slightly above 30 per cent. I don't know how high it is going, but apparently there is a marked difference in the moisture content of timber which is only partially buried in the ground, such as poles or posts.

Our line of argument is this: If we can keep the moisture content in the butt of a post or a pole below the point necessary for the development of these wood destroying organisms, it is reasonable, we think, to assume that the butt will not decay. Just what per cent of moisture is necessary is as yet unknown. It looks as though it will be around 25 per cent. In other words, if the moisture content of a stick can be kept, we will say, below 25 per cent moisture, decay may be eliminated. I hope at the meeting next year I will be able to give you more specific information on this point.

(President Beuhler took the chair.)

THE PRESIDENT: Is there any further discussion on Mr. Cherrington's paper? Mr. Sterling.

MR. STERLING: I hesitate about saying anything in regard to this particular commercial asphaltic oil. The paper described the experiments made, and naturally the author draws certain conclusions, which, unfortunately, we don't quite agree with. However, in my opinion, it is a matter which time only will prove, and I would rather not go into the matter. I can say, however, that the asphaltic oil under discussion does not give nearly as good penetration in beech, bird and maple as creosote oil, while in red oak it goes in fairly well, and in sap pine quite thoroughly. I don't feel at all sure about the results after we get those ties in the ground, but that is a matter, it is to be hoped, we will know more about in five or ten years.

Another point which would influence our final decision very strongly is the fact that it takes materially longer to get an absorption of ten pounds of timber asphaltic oil than it does creosote; in fact, we didn't get ten pounds of timber asphaltic oil in these runs. It takes an hour or two longer, and that in itself would prejudice us against it.

MR. CHERRINGTON: May I ask the Association, as a matter of information, what the maximum quantity of creosote that may be injected into red oak and beech ties is? I have understood the maximum injection of creosote on red oak to be about ten pounds per cubic foot. I would like to have some results practical men have obtained.

THE PRESIDENT: You have heard Mr. Cherrington's question. Is any one prepared to answer Mr. Cherrington?

MR. STERLING: If you have no objection, I would like to call on Mr. Tiffany for comparative results in connection with these particular experiments.

MR. TIFFANY: Referring to Mr. Cherrington's question, I don't know that there is any such thing as an absolute maximum. Ten pounds certainly is not a maximum as we consider it. We are using somewhere near that now in our ordinary treatment. Considering maximum treatment as the use of all the oil possible, we could easily use fifteen or twenty pounds on the red oak which we treat. We have frequently used this amount in runs made in our experimental plant.

I was at Mt. Union when some of the tests, to which Mr. Cherrington refers, were being made. I did not see the runs made in the large cylinder, but I examined the ties after they had been treated. The average penetration of the "timber asphalt" on the loblolly and other sap pine ties was excellent, as his reports indicate; but in the miscellaneous hardwoods, the beech, birch and maple, the penetration was not so deep and the injection was very much slower than it would be with creosote oil. A treatment of between seven and eight pounds of timber asphalt would not compare very favorably with creosote. It must be remembered, however, that this asphaltic oil is much lighter than creosote; consequently there is little comparison of the two, when we speak of a treatment in pounds; we should use gallons or some measure of capacity rather than weight. Yet, using the same amount of oil, measured by gallons, the timber asphalt will not, or at least did not in our experiments, give the same penetration which we expect from creosote.

The penetration of the asphaltic oil under the Rueping process, in our experiments, was not so deep as in the charges treated with creosote. The use of a large quantity of oil and the recovery of a large part of that injected showed practically the same proportion as with creosote. As Mr. Cherrington says, this merely shows the adaptability of this oil, since it probably would never be a success used in this way.

The advantage of this oil to the middle west preservers would be in procuring an oil much cheaper than creosote, so much cheaper that even if the time of treatment were extended for an hour or even two hours, and a considerably greater amount of oil used, there would still be a great economy in its use. With us this could hardly be the case. We would have the long freight haul from the manufacturing plant, which would add greatly to the cost of the oil, while our location on the Atlantic seaboard gives us a minimum rate on imported creosote.

Used as a plug, this asphaltic oil undoubtedly would satisfactorily seal the wood cells and prevent the entrance of moisture. If this is sufficient for preservation, I believe that this oil will insure the desired result; of course, only time can tell us whether such sealing is sufficient.

THE PRESIDENT: In reading over Mr. Cherrington's paper I noticed a statement that the comparative water-proofing properties of this oil and creosote, I think the paper stated, that equal quantities of the two oils, that an absorption of one or two per cent was obtained in the timber treated with asphaltic oil and something like three or four per cent was obtained when treating with the creosote oil. After drying the block that was used in the experiment for twenty-four hours at one hundred degrees; and I would like to ask first what was the gravity of the creosote oil used in connection with this comparative test.

MR. CHERRINGTON: The creosote oil used in this test had a gravity of 1.04.

THE PRESIDENT: I believe that would, without going any further, explain immediately the results that you have obtained. You can't expect the water-proofing quality in an oil with a gravity of 1.04 to compare with the viscous oil that your paper tells about. I have no doubt with an oil of a gravity of 1.10 or 1.12 you would have found the absorption of water on a twenty-pound treatment with creosote to have been less than two per cent, probably less than one per cent; so that that test is hardly a fair test.

MR. CHERRINGTON: The specifications of the City of Cincinnati and, I think, of New York City, state that at any time after treatment the blocks shall show such waterproof qualities that, after being dried in an oven at a temperature of 120° F. for a period of twenty-four hours, weighed and then immersed in clear water for a period of twenty-four hours, and re-weighed, the gain in weight shall not be greater than four per cent. This was the test referred to above.

THE PRESIDENT: The point is that the gravity of the creosote oil is entirely too low to permit of a fair comparison.

MR. TAYLOR: May I ask Mr. Rex whether he considers it a good proposition to have crude oil treatment and creosote treatment at the same plant. They, as I understand, have creosote at Somerville and crude oil at Albuquerque. Now, we want to combine the two, and I would like to know if it is practical from an operating standpoint.

MR. REX: That is simply a matter of construction of tanks and facilities only. We do not separate our treatment, as Mr. Taylor suggested. All is creosoted at Somerville and creosote and crude oil at Albuquerque. We treat no timber at Somerville with crude oil, except in an experimental way. At Albuquerque we treat New Mexico and Arizona pines entirely with California crude oil. The fir and spruces we treat with creosote, of course, at the same plant, and while one has got to have facilities to keep the oils separated, it is simply a matter of facility.

THE PRESIDENT: Any further discussion on this paper?

MR. CHURCH: I would like to ask Mr. Cherrington one question as a matter of information. In referring to this "timber-asphalt" oil, or the oil which he described, he referred to it as asphaltic base oil. I had always understood that the only true asphaltic base oils in the United States were the California oils, and that the others were semi-asphaltic; that is, partly paraffin and partly asphaltic base. I would like to know whether that is true in regard to these oils.

MR. CHERRINGTON: The purely asphaltic base oils, as this paper just stated, are found exclusively in the west. The oils in the central west are, as the speaker just stated, of a semi-asphaltic base, but in various localities you will find the percentage of paraffin present very, very low. The oils we have experimented with have been of a semi-asphaltic base, with a very low per cent of paraffin, practically all of which had been previously extracted from the oil.

THE PRESIDENT: Is there any further discussion? If not, we will proceed with the regular program. Mr. Marshall Taylor will now give us a talk on the "Impurities in Zinc Chloride and How to Avoid Them."

MR. TAYLOR: I have not tried to avoid them, because I don't know how to avoid them. The only proposition about the question of zinc chloride is that a year or so ago I had occasion to analyze zinc chloride, and naturally, as a wood preserver, I turned to the proceedings of the Wood Preservers' Association to get a standard, and in the proceedings of 1905 they gave two analyses, one which was prepared by a committee, and another which was submitted by a company. Upon investigation neither one of these analyses gave absolutely correct results, and under those circumstances it was necessary to devise some new methods of analysis. After considerable delay and investigation we came to a form of analysis which is being used by a good many people who use zinc chloride treatment; but I really brought this subject up in order that the Wood Preservers' Association should revise the method which they have published practically as their standard. They have not really adopted it, but it is given in their proceedings, and the average outsider would turn to it as a standard.

There are certain things in zinc chloride which we probably do not want for timber preservation. Probably ammonium chloride, which is an impurity not so much in the domestic article, mostly in the foreign articles, is something which I do not think we want. As most of you know, especially any who have ever used wood in connection with ammonia, it has a deteriorating effect, and I believe that is one thing which should be kept out of zinc chloride.

At one time I found some manganese chloride in zinc chloride. As to whether that is good or bad impurity we are not able to say; but from laboratory tests on manganese chloride as an antiseptic it would appear that manganese chloride is pretty near as good as zinc chloride, and there are some French tests to confirm that. However, if the fellows are willing to give us pure zinc chloride, I think we better stick to it.

Some years ago the average basis of purchase of zinc chloride was on 97 per cent quality; in other words, 97 per cent of soluble zinc chloride. This is really an impossibility on a commercial scale. Even if you buy the Kahlbaum pure zinc, commercially, you will find the basic material in that zinc chloride runs from 1 to 2 per cent, and they never get all the moisture out of it; so that the whole commercial standard of 97 per cent pure zinc is an impossibility. In recent years I think that the manufacturers have brought that down to 94 per cent. This is saner and is a specification that can be filled.

In this connection, in order that the Wood Preservers' Association may change their method which they have published, I would suggest that a committee be appointed by the President this coming year to investigate this subject and submit a standard; because I appreciate that if the Wood Preservers' Association is to take any stand on wood preserving subjects, they naturally are turned to as people who know the proper standard, and I should think that they should adopt a standard that would insure the purchasers' getting a commercially pure product. In that connection I have prepared a specification which I will be glad to submit to any such committee on that subject.

It is purely technical, Mr. President. I don't see that it is necessary to submit it now and take up the time.

MR. ALLERTON: Now, I have made a great many analyses of zinc chloride, and it was secured from the firm with which our friend, Mr. Townsley, is connected, and that zinc chloride would run from 95 to 97 per cent pure, but I have never made an absolute quantitative analysis of zinc chloride, and I have found it impossible. We know that zinc chloride contains impurities, but they are as a rule merely trivial. I have found manganese and a trace of lead and arsenic and a small quantity of iron and cadmium; I have always found those metals in traces, but simply small traces that might be eliminated as impurities, and have never been able to make a quantitative test of any except iron and zinc chloride and the arsenic; those are the only ones I have made complete quantitative analyses of.

MR. TAYLOR: You won't take them, I suppose, on account of this moisture content. I don't mean to say that the product we are receiving in America is a bad product; it is a fine product.

MR. ALLERTON: I want to make that point, that it is the very best product; far superior to the European zinc chloride.

MR. TAYLOR: Yes, and that is what I said. I think you will find more impurity in the foreign zinc chloride. The only thing is I want to put the Association on a sane specification.

THE PRESIDENT: Any further discussion on this question? Do you make your suggestion in the form of a motion?

MR. TAYLOR: Yes.

MR. ALLERTON: I second the motion.

THE PRESIDENT: It has been moved and seconded that the President appoint a committee to act in 1911 to standardize analyses of zinc chloride. Is there any discussion on this motion?

Upon the motion being put it was carried.

THE PRESIDENT: Mr. Taylor's talk ending our regular program, the rest of the session will be in the nature of a business meeting. We had two committees to report at this session. We will first hear the report from the Commitee on Amendments to the Constitution. I notice Mr. Baker, the chairman, is not present, and I will ask Mr. Card, a member of the committee, to make the report of this Committee on Amendments to the Constitution.

Mr. Card then read the report of the committee.

(Note.—The report was not complete, therefore its publication is postponed until next year.—Sec.)

THE PRESIDENT: You have all heard the report of this committee. What is your pleasure?

MR. CHANUTE: Mr. President, there are so few members here now, I propose that we put this discussion off until this afternoon, when we will have a larger attendance. I put that in the form of a motion, that we wait until this afternoon to discuss it.

SECRETARY ANGIER: I second the motion.

THE PRESIDENT: Is there any discussion on Mr. Chanute's motion?

MR. TAYLOR: I make an amendment to that that you appoint a committee of three now to go over this committee's proposal and see whether there are any points that ought to be brought up. I think there are one or two.

MR. CHANUTE: The reason I made this motion is because I think this ought to be discussed by articles, and I would like to have the discussion of the whole body while we are present in session.

THE PRESIDENT: I might say, Mr. Taylor, that our constitution under which we are working at present provides that the proposed amendments to this constituton must be reduced to writing and signed by at least five corporate members, and forwarded to the Secretary not less than thirty days prior to the annual meeting. Advice of such proposed amendment must then be sent by the Secretary-Treasurer to the corporate members, stating that the question will be acted upon at the next annual meeting. The proposed amendment may be adopted at the annual meeting by a majority vote, but when final action is taken a two-thirds majority of those present and voting shall be necessary for its adoption. In other words, a copy of this, in accordance with our constitution, has already been mailed to every member, so I doubt whether it is necessary to appoint a committee to consider this, as we ought to really act on this as a committee of the whole, and every member ought to read those over carefully and come here prepared to discuss the various points.

Is there any further discussion on Mr. Chanute's motion?

Upon the motion being put it was declared carried.

THE PRESIDENT: As it is just about noon now, in order to give the members time who have not read these proposed amendments over carefully, we will adjourn to meet at one thirty.

An adjournment was then taken till one thirty.

THURSDAY AFTERNOON SESSION.

January 19, 1911.

The meeting was called to order by the President.

THE PRESIDENT: The first order of business will be further action on the report of the Committee on Amendments to the Constitution. Mr. Baker is the chairman of that committee.

MR. BAKER: Mr. Chairman, I would ask that the committee be given another year in which to formulate their report. I think it will take at least a year to get it just as we would like to have it, on account of the fact that we are so widely scattered. If the Association will grant us that time we will appreciate it.

MR. CHANUTE: I second the motion.

THE PRESIDENT: Do I understand, Mr. Baker, that this is a request of the committee for an extension of time?

MR. BAKER: Yes, sir. We had to rush matters to get any report in at all within the thirty-day limit, as prescribed by the constitution, and the action of the committee was not at all satisfactory; that is, we could not all express an opinion as we wished to, and we would like to have another year in which to make the report.

THE PRESIDENT: You have heard the request of the chairman of this committee. What is your pleasure?

MR. LARKIN: Is it necessary to consume a whole year in the preparation of this paper in connection with the amendments? He asked for another year. Is it not possible to frame it up inside of that time, and have a letter ballot? It seems to be an important proposition, and altogether too important to let go for that length of time.

THE PRESIDENT: It is unquestionably of extreme importance, and the committee ought to have sufficient time to get in touch with the various members by letter. Now, it might seem possible that the committee could take this up before our meeting next year and we could get a vote by letter ballot. How do you feel about that, Mr. Baker? Do you think the committee could do that?

MR. BAKER: The committee could take some definite action, and then they would have to submit it for action to the Executive Committee, and they in turn would have to take it up with the membership—would they not—to get a letter ballot? Who would do that, the Executive Committee?

THE PRESIDENT: It would have to be taken up by the membership.

MR. BAKER: Well, who would take it up with the membership?

THE PRESIDENT: In a letter ballot it would have to be passed by a majority of the members.

MR. BAKER: My idea is that the matter should be discussed on the floor in open meeting. I don't know how you could adopt a new constitution and by-laws by letter ballot. Everybody would have to vote yes or no, and it might be that a great many changes would be suggested. They couldn't do it by letter ballot, could they, and have them passed on? The only reason I asked for a year was because I thought the matter ought to be discussed on the floor of the convention.

SECRETARY ANGIER: It seems to me that it would be mixed up if we should attempt to have each member vote by letter. A great many of the members would not vote at all. Would it not be best to postpone this for another year, and then take up each paragraph and vote on them separately?

MR. ALLERTON: Mr. President, I think we might this year get an expression of opinion of the members now present, which would be of service in taking the matter up another year; to get an expression from the Association of an absolutely accurate vote on the changes that we wish to make.

THE PRESIDENT: In order to act on this properly I would request some one to make a motion allowing the committee another year, so that we can get a vote as to the wish of the Association in this regard.

MR. CHANUTE: Mr. President, I make a motion that we give an extension of time to this committee, because it is a very important subject. We are constantly referring to our rules and by-laws, and I think that the committee should have one more year to put this into proper shape so that we can vote on it next year.

MR. SHIPLEY: I would like to amend that by suggesting that the committee request each and every member to send in such recommendations or suggestions that they may have in mind, and that would give the committee a chance to study these things over and do whatever they thought was right, and then present the matter at the meeting, and it can be decided very quickly.

MR. CHANUTE: I agree to that being put into my motion. I thoroughly agree with that.

MR. BAKER: It was my intention, as chairman of that committee, to write to all members of the Association asking for any suggestions they might wish to offer before drafting the report.

THE PRESIDENT: Mr. Chanute, will you put your motion again?

MR. CHANUTE: I make the motion that we give an extension of time to this committee, and they should write to the different members and the members reply to them, so that when our next meeting is held the committee has something definite to submit to the Association.

MR. ALLERTON: Mr. President, I think that the most important section of the proposed revision of the constitution relates to Section 4 of Article 2, in regard to associate members. I will read that—

MR. CHANUTE: There is a motion before the house.

MR. ALLERTON: I am speaking on that motion, am I not?

MR. BAKER: Mr. Chairman, I rise to a point of order. The motion has not been seconded.

MR. ALLERTON: I seconded it.

MR. CHANUTE: With the amendment? I made the motion afterwards.

MR. TAYLOR: I second the motion.

THE PRESIDENT: It has been moved and seconded that the Committee on Proposed Amendments to the Constitution be given another year to perfect their work. Is there any discussion on this motion?

Upon the motion being put it was declared carried by the President.

THE PRESIDENT: I believe it might be well, after we attend to the regular program that we have for this afternoon, after we finish our business, for the committee to talk with as many members, and if possible have open discussion here in order to give the committee as much aid as possible at this time along the line of Mr. Allerton's suggestion. I think that would be of considerable aid to the committee if we did this. This would be in the nature of an informal discussion here with the committee.

We have another committee report, on the Incorporation of the Association. Mr. Angier.

SECRETARY ANGIER: Mr. President and Gentlemen: Your committee has carefully considered the advisability of incorporating this Association under the laws of the State of Illinois, and we recommend that this matter be left to the Executive Committee with full power to act.

THE PRESIDENT: You have heard the report of the committee. What is your pleasure?

MR. BAKER: Mr. President, what are the advantages of incorporation?

THE PRESIDENT: The advantages of incorporation are simply this: The Association not incorporated is not anything. We gather together here in more or less informal discussion; nothing official about our proceedings. Our proceedings can only be official if the Association is properly incorporated. I believe unquestionably the Association should be incorporated. I would like to hear some further discussion.

MR. BAKER: Mr. Chairman, I move you that the Executive Committee be authorized to take such action as may be necessary to incorporate this Association.

MR. CHANUTE: I second the motion.

THE PRESIDENT: It has been moved and seconded that the Executive Committee be given authority in this matter to act as they deem wise. Is there any discussion on this motion?

MR. TOWNSLEY: May I ask a question—for profit or for non-profit?

THE PRESIDENT: Non-profit.

MR. TOWNSLEY: Have the two forms of incorporation been carefully considered and the legal status determined?

THE PRESIDENT: That would be up to the Executive Committee.

Upon the motion being put it was declared carried.

For Articles of Incorporation see pages 11, 12, 13.

THE PRESIDENT: The next order of business is the election of officers. The constitution provides that the officers of the Association shall be a President, three Vice-Presidents and a Secretary-Treasurer, which shall constitute an Executive Committee, in which the government of the Association shall be vested, and it shall have the power to pass upon the eligibility of proposed members, and arrange programs for future meetings, select all subjects for discussion, appoint all committees necessary, and have full power in all matters not otherwise provided for. We have a President, three Vice-Presidents and a Secretary-Treasurer to elect. Nominations are in order for President.

MR. CHANUTE: Mr. President, I nominate Mr. John T. Logan.

MR. BAKER: I second the nomination.

THE PRESIDENT: Mr. John T. Logan has been nominated. Are there any other nominations?

MR. BURKHALTER: I nominate Mr. Amos Smith for President.

MR. LOGAN: I second that nomination.

THE PRESIDENT: Mr. Amos Smith has been nominated. Are there any further nominations?

MR. STERLING: I nominate Mr. Rex.

THE PRESIDENT: Mr. Rex has been nominated. Any further nominations?

MR. BAKER: I move you, Mr. Chairman, that the nominations be now closed.

MR. CHANUTE: I second the motion.

Motion carried.

MR. LOGAN: I appreciate very much the honor in being nominated—

THE PRESIDENT: I am afraid the President will have to call you to order.

MR. LOGAN: —but I am a hearty supporter of Mr. Amos Smith, and I am going to ask all of my friends to cast their vote for Mr. Smith.

MR. REX: I move that we elect Mr. Smith by acclamation

MR. LOGAN: I will second that.

MR. CHANUTE: Out of order.

THE PRESIDENT: I might state that we will make the nominations for all the offices and then proceed to vote upon them.

MR. ALLERTON: I wish to nominate as First Vice-President Mr. Andrew Gibson.

MR. CHANUTE: I second the nomination.

THE PRESIDENT: Any further nominations for First Vice-President?

MR. BURKHALTER: I move that the nominations be closed.

MR. LARKIN: I second the motion.

Motion carried.

THE PRESIDENT: Nominations for Second Vice-President are now in order.

MR. CARD: Mr. President, I nominate Mr. Calder for Second Vice-President.

MR. TAYLOR: I second the nomination.

THE PRESIDENT: Any further nominations?

MR. NEWTON: Mr. President, I move that the nominations be closed.

MR. STERLING: I second that motion.

Motion carried.

THE PRESIDENT: Nominations for a Third Vice-President are now in order.

MR. LOGAN: I nominate Mr. Grant B. Shipley for Third Vice-President.

MR. PARMINTER: I second that nomination.

THE PRESIDENT: I might say that Mr. Shipley at present is not a corporate member. He is entitled to corporate membership at this time, but when he joined the Association he was not entitled to it.

MR. LOGAN: Of course, I didn't know that he was in disrepute. I suggest that he be fined ten dollars for being in disrepute.

THE PRESIDENT: I might say, Mr. Logan, that I think the Association is the loser by the fact that he is not a corporate member. We hope soon to remedy that defect.

MR. SHIPLEY: I withdraw in favor of Mr. Chanute, please.

THE PRESIDENT: Nominations for Third Vice-President are now in order.

MR. CHANUTE: I nominate Mr. Philip Smith.

THE PRESIDENT: Mr. Smith has been nominated. Any further nominations?

MR. TOWNSLEY: I second that nomination.

MR. ROLLINS: I nominate Mr. Burkhalter for Third Vice-President.

MR. CHANUTE: I withdraw my nomination of Mr. Philip Smith, because Mr. Amos Smith has been nominated and you can't have two members of one firm.

THE PRESIDENT: Mr. Burkhalter has been nominated.

MR. CHANUTE: I second the nomination.

THE PRESIDENT: Are there any further nominations?

MR. CARD: I move that the nominations be closed.

MR. BAKER: I second that motion.
Motion carried.

THE PRESIDENT: Nominations are now in order for Secretary-Treasurer.

MR. SHIPLEY: I nominate Mr. Angier.

MR. LOGAN: I second that nomination.

MR. TAYLOR: I move that the nominations be closed.

MR. STERLING: I second that motion.

MR. BAKER: There is a second to that motion, but as a further indication of our appreciation of the work he has done I move that we elect Mr. Angier by a rising vote at once.

MR. CHANUTE: I second the motion.

THE PRESIDENT: We will reverse the order of things and vote for the Secretary-Treasurer first.

Motion carried unanimously.

MR. ANGIER: Gentlemen, I thank you very much for the honor.

THE PRESIDENT: I appoint Mr. Rex and Mr. Larkin as tellers. Kindly prepare ballots for the election of a President.

Upon the collection and counting of the ballots Teller Larkin announced the following result: Mr. Logan, 11; Mr. Smith, 4; Mr. Rex, 8. As Mr. Logan has not the majority it will be necessary to take another vote.

MR. REX: I beg to withdraw my name as nominee for President.

MR. STERLING: I object, Mr. President. He is out of order.

The result of the re-ballot was as follows: Mr. Logan, 12; Mr. Rex, 2; Mr. Smith, 9.

MR. LOGAN: I want to briefly express my hearty appreciation, gentlemen, of the honor, but I question your judgment very seriously. However, I promise that the Association shall have my very best efforts, and I shall endeavor to maintain the standard which my predecessors have established in all the affairs of the Association with which I may have to do. Thank you.

THE PRESIDENT: As there is only one nomination, I declare Mr. Andrew Gibson elected First Vice-President.

There was only one nomination for Second Vice-President, Mr. Calder, and I declare Mr. Calder elected Second Vice-President.

As Mr. Burkhalter is the only nominee for Third Vice-President, I declare Mr. Burkhalter elected.

Gentlemen, I take considerable pleasure in turning over this gavel to Mr. Logan, and I hope you will pardon me if I will have just a few words to say in passing. I have been connected actively with the Association as President for three years. I have seen the Association grow considerably in that three years. We have, however, reached a point now, gentlemen, where the field for this Association is broadening considerably. You will note in reading our proceedings that the Association, as a body, does not in any of our proceedings declare, as an Association, for any standards, first, in operation or as to specifications for materials used in preservation.

We are reaching the point where each day, practically, the Secretary or myself, especially in the past year, have been receiving communications from not only this country, but communications from abroad, requesting copies of our proceedings and also requesting the recommended standards of this Association. We have had to in each case reply that the Association as an Association have not recommended any standards, but they would find the opinions of the individual members of the Association in our proceedings, which proceedings we have in each case, of course, mailed to those who have requested a copy. It seems to me that it is time for the Association now to go on record in some matters. I believe we ought to go on record especially as to the specifications of preservatives. We ought to go on record in certain recognized methods of procedure in operation; so that any one reading our proceedings not alone has a lot of miscellaneous opinions, but actually has recommendations of the Association as an Association.

Now, I realize that there are a great many questions that it would be pretty hard to get a definite vote on in recommending a standard. That is naturally the case, as the Association is made up of men representing different sections of the country and necessary different conditions; so that it is not practical to recommend in all features of wood preservation definite standards that would be universal standards, but there are a great many features that can be recommended as universal standards. The Association now has a very representative membership. Its members are practical men; they know what they want and they know how to get what they want.

So, in passing, I would like to request that the Association by some scheme, possibly by the appointment of committees to work during the year on certain standards and then report at the annual meeting, or in some way that will be worked out by the Executive Committee, and come prepared at the next meeting of the Association to actually recommend definite standards. Gentlemen, I thank you. (Applause.)

(Mr. Beuhler then retired and Mr. Logan took the chair as President.)

MR. LOGAN: Gentlemen, I will just take the seat to see how it feels. Well, as my first act before we adjourn, which seems to be all that devolves upon me, and before the outburst of applause dies away, which was an exhibition of the appreciation of the retiring President's few remarks, I would like to see a motion thanking Mr. Beuhler for his very efficient service.

MR. ALLERTON: I make that motion, Mr. Logan, that we extend a vote of thanks to Mr. Walter Beuhler for his untiring devotion and his worthy efforts and his absolutely successful presidency of this Association.

MR. CHANUTE: I second the motion.

An unanimous rising vote was given Mr. Beuhler.

MR. BEUHLER: Gentlemen, I again thank you.

MR. BURKHALTER: I would like to inquire, Mr. President, in regard to the status of the next place of meeting.

THE PRESIDENT: We will have to take Mr. Beuhler to task after complimenting him so highly, for overlooking the necessity of mentioning to me that point. I beg to be enlightened on that point as to what action is necessary.

MR. BEUHLER: The Association can either vote and elect a place, or the Association can refer that matter to the Executive Committee with power to act. It is the pleasure of the Association what they want to do.

THE PRESIDENT: I would like to hear any further discussion on that subject.

MR. CARD: I move that we take a vote on it, as to where the meeting place shall be next year.

MR. ALLERTON: I second the motion, and I will make a few remarks on it, because we will have the pleasure of nominating—

MR. TOWNSLEY: You are out of order.

THE PRESIDENT: It has been moved and seconded that the Association take action as to where the next annual meeting shall be held.

MR. BURKHALTER: Mr. President, I would like to inquire if the motion is in order to refer that to the Executive Committee.

THE PRESIDENT: We will put this motion first, Mr. Burkhalter. All those in favor of Mr. Card's motion will signify it by saying, Aye; contrary, No.

Motion carried.

THE PRESIDENT: Nominations are in order.

MR. ALLERTON: I might start the nominations, as I did last year, and I got one vote; and now I am going to name the same place—St. Louis, because it has very few attractions and all the members may be present at the meetings. I have said all I can in favor of St. Louis.

MR. BAKER: Mr. President, I want to nominate for the next place of meeting one of the most delightful cities in the country; the climate is salubrious—

A MEMBER: Alamogordo.

MR. BAKER: No, sir. El Paso, Texas.

MR. TOWNSLEY: I second the nomination.

MR. REX: I will nominate New Orleans.

MR. CARD: I second the nomination.

THE PRESIDENT: Any further nominations, gentlemen?

MR. CHANUTE: I nominate Chicago, because I think this is the most central location and where we get the greatest crowd together. For the good of the Association, and to get the greatest exchange of ideas, I think we ought to meet here.

MR. BEUHLER: I agree with Mr. Chanute that Chicago is the logical place for this Association to meet. Personally, I would enjoy going to New Orleans; I would enjoy having an excuse to go to New Orleans at this time of year, but we have something else to consider. If we go as far away as New Orleans there is a possible danger of decreased attendance. We have had the meeting here I think now two or three years, each year with an increased attendance. Chicago is centrally located and we can enjoy here not only our own membership, but a great many men interested in our problems will come to hear us that will not come to New Orleans. So I believe Chicago is really a more logical place to meet than New Orleans.

THE PRESIDENT: With those remarks you second the nomination for Chicago?

MR. BEUHLER: I second the Chicago nomination.

MR. CARD: I move that the nominations be closed.

MR. BEUHLER: I second the motion.

Motion carried.

THE PRESIDENT: I will appoint Mr. Chanute, Mr. Baker and Mr. Card, if you please, to take the ballots.

Upon the ballots being taken and counted the following result was announced: Chicago, 12; New Orleans, 11; El Paso, 1.

THE PRESIDENT: I am going to ask the retiring President to assist in the ruling. I am not quite familiar with the by-laws.

MR. BEUHLER: I don't believe for this proceeding it is necessary to have a majority.

THE PRESIDENT: There being nothing to the point in the constitution, gentlemen, the Chair will declare another vote in order.

TELLER CHANUTE: The result of the re-ballot shows 13 for Chicago and 12 for New Orleans; nothing for El Paso.

MR. CARD: We have got an extra vote there.

MR. LARKIN: Mr. Goltra just came in and didn't vote before.

THE PRESIDENT: Mr. Chanute, you nominated Chicago. Do you want to take it with 13 votes?

MR. CHANUTE: Yes, I will take the 13 votes. I was born on the thirteenth of the month.

THE PRESIDENT: Chicago is then declared the meeting place of our next annual meeting. Is there any further business? If not, a motion to adjourn is in order.

MR. SHIPLEY: It is the general expression of the members that our Secretary in the past year has done an enormous amount of detail work for which he received no compensation, and I think the members as a body ought to recommend to the Executive Committee that they reimburse him or show their appreciation in some way so that he will be properly remunerated for his services. I make that as a motion.

MR. CHANUTE: I second the motion.

Motion unanimously carried.

MR. BAKER: I move you, Mr. President, that we adjourn.

Motion duly seconded and carried.

The Seventh Annual Convention of the Wood Preservers' Association then adjourned.

Statistical Information

THE FOREST PRODUCTS LABORATORY.

By McGarvey Cline, Director.

What It Is.—The Forest Products Laboratory is a laboratory of practical research conducted by the Forest Service, United States Department of Agriculture, in coöperation with the University of Wisconsin. The purpose of the laboratory is:

1. To secure authoritative information on the characteristic mechanical and physical properties of commercial woods and products secured from them.

2. To study and develop the fundamental principles underlying the preservative treatment of wood, its use for the production of fiber products (pulp, paper, fiber board, etc.), and its use in the manufacture of alcohol, turpentine, rosin, tar and other chemical products.

3. To develop practical ways and means of using wood which, under present conditions, is being wasted.

4. To serve as a public bureau of information on the properties and utilization of forest products.

5. To co-operate with consumers of forest products in improving present methods of use; also in formulating specifications and grading rules for commercial woods, materials secured from them (gums, oils, resin, etc.), and materials used in the treatment of wood (creosote, zinc, chloride and other preservatives).

The laboratory is at Madison, Wisconsin, and is situated on the northwest corner of Randall Field, the athletic field of the University of Wisconsin. The university furnishes, without cost to the Forest Service, the building, grounds and the heat, light and power required for the operation of the laboratory. The Forest Service employs the entire staff, supplies all equipment, and pays all other operating expenses. The equipment is available to the faculty and students of the university for research purposes only, and the laboratory staff presents a course of lectures at the university on the commercial uses of the forest resources of the country.

Its Field of Work.—The following summary of the kinds of work conducted at the laboratory will give the reader a fairly comprehensive idea of its field of work:

1. Physicial characteristics of wood:

The physical properties of woods studied are its specific gravity, shrinkage, microscopic structure, and, in the case of some species, its specific heat and heat conductivity. Data secured from investigations of this class are chiefly used in correlating the results of other experiments.

2. Mechanical properties of wood:

The term "mechanical properties" as used in the laboratory is applied to those properties of wood which enable it to resist the action of mechanical forces. Strength, stiffness, hardness, and toughness are examples of such properties. This work includes tests on small, clear specimens free from defects, structural timbers, and manufactured forms such as spokes, axles, etc. Tests are also made to determine the effect of methods of seasoning, preserving, and fire-proofing on the mechanical properties. The chief purpose of work of this character is to furnish engineers and architects data upon which to base moduli for design and upon which to base commercial specifications; to permit manufacturers using wood to judge the desirability of substituting other woods for those becoming scarce; and to determine how wood can be seasoned and treated with the least injury to its strength.

Fig. 1 — Forest Products Laboratory. Front and side view.

3. Chemical characteristics and properties of wood:

This work consists of experiments to determine the quantity and quality of essential oils, tannins, gums and other products which may be secured from different woods. It bears directly on the practicability of using certain forms of forest waste.

4. Artificial drying of wood:

This class of work includes the study of commercial dry-kilns and their operation; also the experimental study of different methods of drying wood. The proper seasoning of wood is a most important factor in its use, and one which is at present too frequently neglected.

5. Agencies destructive to wood:

A branch of the Office of Forest Pathology of the Bureau of Plant Industry is located at the laboratory for the purpose of studying wood-destroying fungi and how they are affected by various wood preservatives. The chief purpose of this work is to suggest ways and means of perfecting the preservative treatment of wood. The laboratory also co-operates with the Bureau of Entomology in studying insects and other animal organisms which destroy wood.

6. Wood preservation:

This division of work includes all problems dealing with the impregnation of wood with preservatives, fire-proofing substances and other materials. At present its attention is largely directed to the study of preservatives and preserving processes. Wood preservation concerns principally the railroads, mines and other large consumers of structural timbers, but it also is of much interest to the building trades and to municipalities interested in wood as a paving material.

7. Wood distillation:

This line of activity is directed to the study of methods of distilling wood and methods of refining and grading the products secured. Work is also done to demonstrate the practicability of using certain of the products for different purposes, thus creating a market for them. This work bears directly on the possibility of using the enormous quantities of mill and forest waste.

8. Pulp and paper industries:

The pulp and paper work of the laboratory is confined to the study of the use of different species and forms of wood for the production of pulp and paper products. The chief purposes of the work are to determine the value, for the production of pulp, of woods not being used at present, and to conduct experiments for the purpose of perfecting present methods of manufacturing wood pulp. Especial attention will be given in this work to the development of methods of manufacturing a commercial pulp from wood which is at present being wasted.

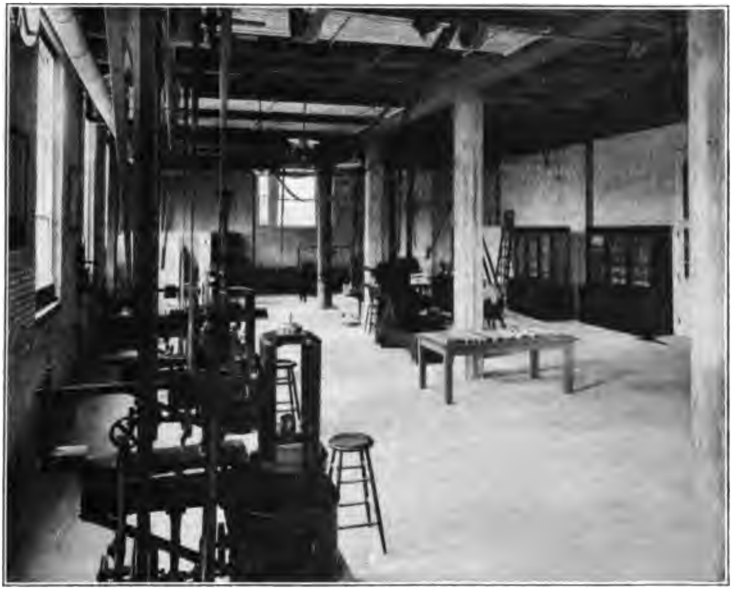


Fig. 6 — Timber Testing Laboratory, showing 30,000 lbs. universal testing machine in the foreground and machine shop equipment in the background

9. Production of naval stores:

Methods employed in the production of turpentine and rosin are also studied by the laboratory. Work of this character is confined to the chipping of the trees, the collection of the gum, and the distillation of the resin secured. The present methods employed in the production of naval stores are crude and result in much unnecessary damage to the standing timber, and cause an unnecessary loss in value of the turpentine and rosin produced. The purpose of the work conducted by the laboratory is to improve this situation.

Its Organization and Equipment.—The laboratory is divided into the following nine sections:

Maintenance.
Engineering.
Timber Tests.
Wood Preservation.
Wood Technology.
Wood Distillation.
Pulp and Paper.
Chemistry.
Pathology.

These sections are responsible to the Director and to two Assistant Directors.

Maintenance.—The section of Maintenance is charged with the general up-keep of the building and the purchase of all supplies and equipment. It also supervises the force maintained for handling computing work of a routine character and the section of stenography. It also has charge of the library and file room and the indexing and filing of all laboratory records.

Engineering.—The section of Engineering has charge of the storage yards, the sawmill, the wood shop, machine shop, and drafting-room. It is charged with the care of all materials stored in the yard, the design and repair of apparatus. Its work, however, is conducted in collaboration with the other sections of the laboratory.

Timber Tests.—Fig. 6 shows a general view of the timber-testing laboratory. This section conducts all tests to determine the mechanical properties of natural or treated wood. The following series of tests, which are under way at present, is representative of those conducted in the laboratory:

1. Tests to determine the relative mechanical properties of the commercial woods of the United States.

These tests are being made upon material secured from the forests, and include the study of all the mechanical properties which determine the suitability of wood for different uses.

2. Tests to determine the effect of mechanical operative features of pressure wood-preserving plants on the strength of wood.

3. Tests to determine the mechanical efficiency of joints and fastenings used in wooden structures.

Wood Preservation.—The section of Wood Preservation studies the problems confronting the wood-preserving industry. These problems may be broadly classified into:

a. Those dealing with the preservatives themselves.

b. Those dealing with the methods of getting the preservatives into the woods.

To study the first class of problems, the laboratory is provided with a fungus pit which contains chambers thoroughly inoculated with various wood-destroying fungi. The humidity and temperature of the pit will be so regulated that conditions in it will be most favorable to the growth of fungi. Wood will be treated with different preservatives and placed in the pit. The efficiency of the preservative will be determined by its ability to resist the fungi. In addition to such laboratory experiments, timbers are treated and placed in actual service and are carefully inspected at periodic intervals.

The second class of problems are primarily problems of mechanical engineering, dealing with the methods of forcing the required amounts of various preservatives into the different species and forms of wood. The laboratory is well equipped for studying any of the processes used for the preservative treatment of wood. Fig. 7 gives a general view of the laboratory. The storage tank in the yard is sufficient in size to provide for a carload of any preservative. Typical projects at present under way are:

1. Service tests on red oak and maple cross ties, in co-operation with the Chicago, Milwaukee & St. Paul Railway Company, to determine the relative efficiency of standard preservatives and processes.

This work calls for the preservative treatment of approximately 1,600 red oak and maple cross ties, which, after treatment, will be placed in a test track by the Chicago, Milwaukee & St. Paul Railway. The track will be inspected and its condition reported from year to year by the staff of the laboratory.

2. The fungicidal properties of coal-tar creosote fractions.

These experiments are for the purpose of determining the relative efficiency of different fractions of coal-tar creosote in preventing decay. Specimens treated with the different fractions are also being placed in the waters of the Gulf of Mexico and the Bay of San Francisco to determine the relative efficiency of the different fractions in protecting yellow pine from marine borers.

3. The preservation of timbers used in the construction of silos.

Wood Technology.—In addition to the equipment shown on the laboratory plan, this section is provided with microscopes, microtomes, and other apparatus required for the study of wood structure. It is also equipped with taking photomicrographs. Work at present under way includes:

1. The correlation of microscopic structure of commercial woods with their properties and uses.

2. Temperature changes in wood under treatment.

These experiments are designed principally to determine the rapidity with which wood may be heated under different conditions.

3. The analytical study of artificial methods of drying wood.

These experiments will be conducted in an especially designed steam-jacketed cylinder which is so connected with air pumps and sources of steam supply that a great variety of conditions can be secured.

Distillation.—This laboratory is at present equipped for studying both steam and destructive distillation processes. It is also equipped with a fractionating column still which, at this time, is set up at the plant of the Atlantic Turpentine Company at Mount Pleasant, Georgia, where experiments are being conducted with it to determine the best method of commercially refining wood turpentines. The still is of such a capacity that materials can be handled on a commercial scale. The work of this section naturally divides itself into:

a. Experiments to determine what products and how much of them can be secured from different woods.

b. The design and operation of machinery best adapted to the production of those products having the greatest value.

c. Refining of the crude products.

At the present time the energies of the section are directed entirely to the study of resinous woods. The woods being first investigated are southern pine and Douglas fir.

Pulp and Paper.—Fig. 10 shows the 15-inch Fourdrinier paper machine, and, in the background, washers, screens and other equipment of the laboratory. In addition to the equipment shown on the plans of the pulp and paper laboratory, the Forest Products Laboratory has just completed the installation of a ground-wood laboratory at Wausau, Wisconsin. The laboratory at Wausau is equipped with a heavy-duty commercial grinder connected with a 500 horse-power motor-generator set. It also contains screens, a wet machine, a barker, and other equipment necessary for the commercial manufacture of ground-wood pulp. The plant is so designed that the speed of the grinder can be varied through wide limits. Its chief purpose is to determine whether commercial ground-wood pulp can be made from woods other than spruce. The work at Wausau is being conducted under a special appropriation.

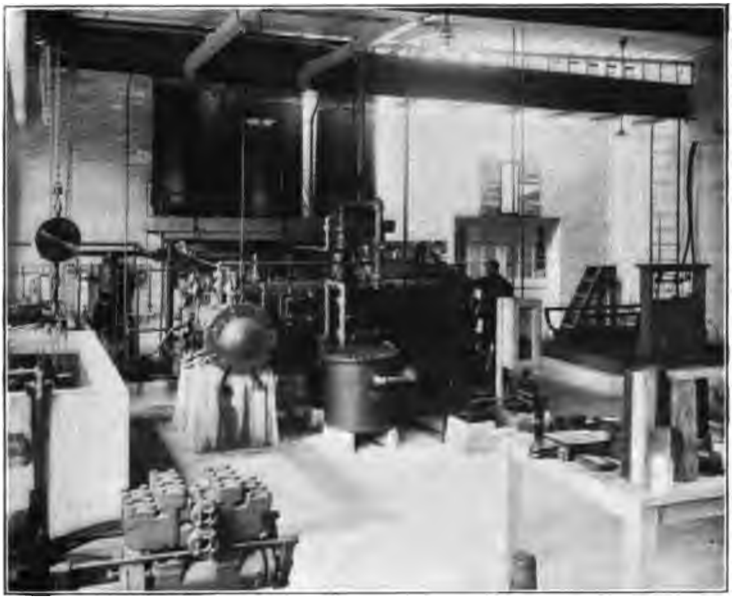


Fig. 7—Wood Preservation Laboratory, showing experimental cylinders and measuring tanks.

Chemistry.—Fig. 11 shows the general arrangement of the chemical laboratory and its equipment. The work of the section of Chemistry is largely to supplement the work of the other laboratories. Its purposes are:

a. To find uses for products at present having little or no commercial value.

b. To secure data upon which to base commercial specifications for wood products, wood preservatives, and other chemical problems that come up in connection with the work of the other sections.

Typical projects are:

1 The classification of commercial creosotes according to their chemical and physical properties.

2. Experiments to determine the quantity and quality of tannin in various kinds of wood and bark.

3. Methods of analyzing treated wood to determine the kind and quantity of preservative in it.

Pathology.—As previously stated, the section of Pathology is not, correctly speaking, a section of the Forest Products Laboratory, since its work is under the direction of the Bureau of Plant Industry. The man detailed to the laboratory, however, gives his full time to the study of pathological problems bearing on the use of wood. The Forest Products Laboratory supplies him with facilities for work and he is treated in every respect as a member of the laboratory staff. An extensive collection of wood-destroying fungi is being made and cultures of them are being propagated in the fungus pit of the wood-preserving laboratory. The section of Pathology co-operates with the laboratory in conducting this class of work.

How It Works—Internal Relations.—The preceding part of this paper, it is hoped, has given the reader a fair conception of the purpose of the laboratory, its field of work, and its material resources. Its success, however, must depend largely upon the personnel of the organization and upon the ability of the different men composing it to work together in a manner which will insure co-operation on the part of the different sections and the proper co-ordination of their work.

The entire staff of the laboratory, consisting of approximately sixty people, is employed in accordance with the regulations of the United States Civil Service Commission. The men are recruited from the professions of engineering, chemistry, forestry, and pathology, also from the different grades of clerks and skilled laborers. A large percentage of the staff are young and comparatively inexperienced, this condition being due chiefly to the newness of the work and to the loss of experienced men to commercial interests. It is therefore necessary to have the staff so organized that new material will be trained as soon as possible by the more experienced men of the organization, and that plans of work and records of experiments shall be made and kept in such a way that, with a reasonable amount of study, the work of any man can be taken up and completed by another with the least loss of time and money. With this in view, the following principles are closely adhered to:

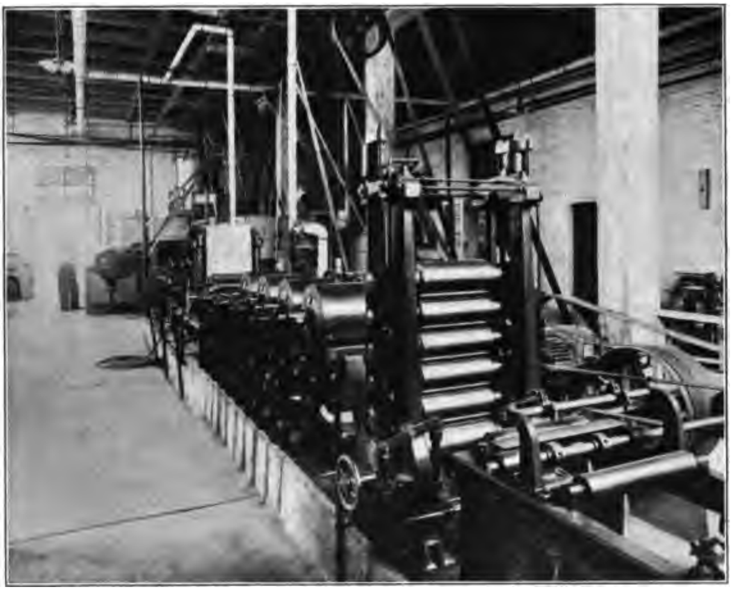


Fig. 10 — Pulp and Paper Laboratory, showing Fourdrinier paper machine and, in the background, washers, screens and other equipment.

1. Each investigator must have a clear conception of the purpose and value of his investigation and the methods which he intends to follow in conducting it, and that he make such conceptions and methods a matter of record.

2. The plans for conducting investigations should be perfected, so far as possible, before work is actually begun.

3. That all pertinent information on the materials used in the experiments should be secured and recorded.

4. That in the different sections standard methods and terms be used, so far as possible, in order that the work of the laboratory may be co-ordinated to the best advantage.

5. That frequent partial summaries and analyses of results be made so that plans may be modified, if necessary, before the work has proceeded too far.

6. That final and complete summaries and analyses of results be embodied in a report which shall be a permanent record of the work.

To facilitate the application of these principles and to insure the publication of results as soon as possible, the experimental work of the laboratory is classified into projects. A project may consist of a series of tests or experiments conducted

a. For the purpose of investigating some specific problem on experimental research;

b. To verify experimental results on a commercial scale;

c. To assist outside parties in the application of scientific principles and processes of recognized commercial value with which the laboratory is familiar.

Projects may be conducted independently by the laboratory or in co-operation with an individual or commercial or other organization.

Each project is assigned to a member of the staff, who is responsible for taking the initiative in all matters pertaining to it. In general, such an assignment involves:

1. A preliminary investigation: This work embraces a review of literature and results which have been secured by previous investigators, also frequently tentative experiments to ascertain the best methods of attacking a problem. The results of a preliminary investigation are summarized in a written report, which sometimes is made the basis of a publication.

2. Working plan: If the preliminary investigation shows the need of further work, a working plan is prepared. This plan records the purpose of the work, gives instructions for collection of material required and the methods which it is proposed to follow in conducting the work.

3. Description of material: If the working plan is approved, the materials called for are secured and a record made of their origin and history.

4. Progress reports: From time to time as work on a project progresses, the man in charge of it prepares project reports containing summaries and analyses of results secured, in order to determine whether it is necessary to make modifications in the working plan.

Fig. 11—Chemical Laboratory

5. Project report: When all the data called for by any plan are obtained, the man in charge of a project prepares a final report, giving a full discussion of results and conclusions reached. Project reports are the bases for most of the circulars and bulletins published by the Department, dealing with the work of the laboratory.

In order to give the fullest opportunity for constructive criticism, all working plans are submitted to one of the technical committees with which the staff is organized, each committee being composed of the members of the staff most experienced in the lines of work referred to it for consideration. Committee work of this character has precedence over all other work of the laboratory. After review by the committee, to give further opportunity for constructive criticism, and to keep the different members of the staff informed on all of the work of the laboratory, working plans are presented and discussed at the general staff meetings which are held each Saturday. All men in charge of important lines of work attend the general staff meetings. After full opportunity has been given for discussion, all plans are submitted to a committee composed of the director and two assistant directors for approval. Results of preliminary investigation, progress on various projects, inspection trips, and other matters of general and technical interest are discussed at the staff meetings.

Once a month seminar meetings, open to the entire technical staff of the laboratory, are held, at which the technical literature relating to the work of the laboratory is reviewed, and technical papers are presented.

Relations to Societies and Associations.—It is the constant aim of the laboratory to relate itself closely to the activities of societies and associations interested in its work, and to make such relations of mutual advantage. With this in view, members of the staff are encouraged to become members of the organizations of this character in which they are most interested, and when they are honored by committee assignments, it is the policy of the laboratory to do everything possible in making such service of value to the society or association and a credit to the Forest Service. Such co-operation is not limited to the organizations represented on the laboratory staff, but is extended to all societies and associations which may wish to use the resources of the laboratory.

Relation to Individuals and Commercial Organizations.—As stated in the first pages of this paper, one of the chief purposes of the Forest Products Laboratory is to serve as a public bureau of information on the field of work which it covers, but it is not the policy of the Forest Service, aside from making available information which it has, to undertake work of any kind which is not of general interest to the lumbering or to one of the wood-using industries. It is frequently the case, however, that a problem confronting a commercial organization is one of general interest, and is also one in which the laboratory is interested. In such cases it is the policy of the Service to co-operate with the commercial organizations, the co-operating organization sharing the expense of the investigation in proportion to the direct benefits which result to it from the work done. Co-operation of this character varies from cases in which the co-operator merely furnishes a part of the material required for the work, to cases in which the entire expense of the work is borne by the co-operating company, the laboratory merely supplying the men to supervise the work. In all co-operative work of this character the Department of Agriculture reserves the right to first publish the results.

The possible value of the Forest Products Laboratory to the lumbering and wood-using industries will be readily recognized by all who are familiar with the problems confronting these industries. The actual value of the laboratory, however, depends upon its ability to obtain results of practical value. To secure such results to the best advantage it must have the support and co-operation of the men who are in constant and intimate association with commercial problems. The Service therefore invites such men to share with it the responsibility of making the Forest Products Laboratory play an important and useful part in reclaiming the wastes of the forests and in increasing efficiency in the commercial use of wood.

Note.—Further description of the Forest Products Laboratory may be obtained by writing to Mr. Cline at Madison, Wisconsin.

Secretary.

WOOD PRESERVING PLANTS IN THE UNITED STATES.

Name of Company.	Location.	Year Built.	No. of Retorts	Process.
American Creosote Works, Ltd	New Orleans, La.	1902	2	Creosote (Labrot).
American Creosote Works, Ltd	Bossier City, La.	—	1	Creosote (Labrot).
American Creosoting Co	Newark, N. J.	—	—	
American Creosoting Co	Hugo, Okla.	1907	2	Lowry.
American Creosoting Co	Marion, Ill.	1907	2	Lowry.
American Creosoting Co	Kansas City, Mo.	1907	2	Lowry.
American Creosoting Co	Springfield, Mo.	1907	2	Lowry.
American Creosoting Co	Shirley, Ind.	1905	2	Lowry.
Anaconda Copper Mining Co	Butte, Mont.	—	—	
A., T. & S. F. Ry. Co	Albuquerque, N. M.	1907	3	Bethell, and Crude Oil
Atlantic Creo. & Wood Pres. Works	Norfolk, Va.	—	3	Bethell.
Ayer & Lord Tie Co	Carbondale, Ill.	1903	8	Various.
Ayer & Lord Tie Co	Grenada, Miss.	1904	4	Various.
Ayer & Lord Tie Co	Argenta, Ark.	1908	4	Various.
Barber Asphalt Paving Co	Maurer, N. J.	1907	4	Bethell.
Bunker Hill & Sullivan Mining and Concentrating Co.	Kellogg, Idaho	1908	1	Creosote (Low Pressure)
Buffalo, Rochester & Pittsburg R. R. Co	Bradford, Pa.	1910	1	Bethell
C., B. & Q. R. R. Co	Galesburg, Ill.	1907	3	Card
C., B. & Q. R. R. Co	Sheridan, Wyo.	1899	2	Burnettizing
C. & N. W. Ry. Co	Escanaba, Mich.	1903	3	Card
Chanute & Co., O.	Mt. Vernon, Ill.	1899	1	Burnettizing
Chicago Tie and Timber Preserving Co	Waukegan, Ill.	1907	2	Card
Colman Creosoting Works	Seattle, Wash.	1884	2	Bethell
D., L. & W. R. R. Co. (Coal M. depot)	Nantikoke, Pa.	—	—	Creosote (Non-Pressure)
D. & R. G. Ry. Co	Alamosa, Colo.	—	3	
El Paso & Southwestern Ry	Alamogordo, N. M.	1902	2	Rueping
Eppinger & Russell Co	Long Island City, N.Y.	1878	4	Bethell
Eppinger & Russell Co	Jacksonville, Fla.	1909	2	Various
Federal Creosoting Co	Bound Brook, N. J.	1909	2	Lowry
Federal Creosoting Co	Patterson, N. J.	1909	2	Lowry
Federal Creosoting Co	Toledo, Ohio	1909	3	Lowry
Federal Creosoting Co	Rome, N. Y.	*1911	2	Lowry
Galveston Creosoting Co	Galveston, Texas	1892	1	Bethell
Georgia Creosoting Co	Ficklin, Ga.	—	—	Cresote
Great Northern Ry. Co	Somers, Mont.	1901	4	Burnettizing
Gulfport Creosoting Co	Gulfport, Miss.	1906	2	Bethell, Rueping
Homestake Mining Co	Lead, S. D.	1909	1	Creosote (Low Pressure)
Hercules Mining Co	Burke, Idaho	—	—	Creosote (Non-Pressure)
Indiana, Columbus & So. Traction Co	Columbus, Ind.	1909	1	Creosote (Low Pressure)
Indiana Tie Co	Evansville, Ind.	1907	3	Burnettizing

Indiana Tie Co.	Joppa, Ill.	1910	—	Burnettizing
Indiana Creosoting Co.	Bloomington, Ind.	1907	2	Lowry
Indiana Zinc-Creo. Co.	Terre Haute, Ind.	1904	1	Card
International Creo. & Const. Co.	Texarkana, Texas	1902	2	Allardyce, Burnettizing
International Creo. & Const. Co.	Beaumont, Texas	1897	1	Bethell
Kansas City Creosoting Co.	Kansas City, Kan.	1907	4	Various
Kettle River Co.	Sandstone, Minn.	1905	2	Various
Kettle River Co.	Madison, Ill.	1909	4	Various
Louisiana Creosote Co.	Winnfield, La.	—	—	Creosote (Low-Pressure)
M., K. & T. R. R. Co.	Dennison, Texas	1909	4	Rueping
National Lumber & Creo. Co.	Texarkana, Ark.	1902	2	Burnettizing, Bethell, and Card
New Orleans Wood Pres. Co.	New Orleans, La.	1888	1	Creosote
Norfolk Creosoting Co.	Buell (near Norfolk)	1896	4	Bethell
Northern Pacific Ry. Co.	Brainard, Minn.	1907	2	Lowry
Northern Pacific Ry. Co.	Paradise, Mont.	1907	2	Lowry
Oregon Short Line	(Portable Plant)	1902	2	Burnettizing
O. R. & N. Co.	Wyeth, Ore.	—	—	Creosote (Boiling), Burnettizing
Otis, Allen & Son	Portsmouth, N. H.	—	4	Kyanizing
Otis, Allen & Son	Lowell, Mass.	1848	2	Kyanizing
Pacific Creosoting Co.	Eagle Harbor, Wash.	—	8	Creosote (Boiling)
Pennsylvania R. R. Co.	Philadelphia, Pa.	—	1	Creosote (Non-Pressure)
Pennsylvania R. R. Co.	Mt. Union, Pa.	1909	1	Various
Philadelphia & Reading Coal & Iron Co.	Pottsville, Pa.	1908	1	Various (Non-Pressure)
Pittsburgh Wood Preserving Co.	Connellville, Pa.	*1911	2	Various
Puget Sound Wood Preserving Co.	Lowell, Wash.	—	3	Creosote (Special)
Republic Creosoting Co.	Indianapolis, Ind.	1896	1	Creosote
Republic Creosoting Co.	Minneapolis, Minn.	1903	2	Creosote
Republic Creosoting Co.	Mobile, Ala.	1905	2	Creosote
Shreveport Creosoting Co.	Shreveport, La.	1910	2	Lowry
Southern Creosoting Co., Ltd.	Slidell, La.	—	2	Bethell
San Pedro, Los A. & Salt Lake R. R. Co.	Nr. E. San Pedro, Cal.	—	—	Burnettizing, Creosote
Southern Pacific Ry. Co.	W. Oakland, Cal.	1889	2	Creosote (Boiling), Burnettizing
Southern Pacific Ry. Co.	Los Angeles, Cal.	1894	2	Same
Southern Wood Preserving Co.	Atlanta, Ga.	—	—	Creosote
Texas & New Orleans Wood Pres. Co.	Houston, Texas	—	5	Bethell, Burnettizing
Texas Tie & Lumber Pres. Co.	Somerville, Tex.	1905	5	Rueping
Tennessee Coal, Iron & R. R. Co.	Birmington, Ala.	—	—	
Union Pacific R. R. Co.	Laramie, Wyo.	1903	2	Burnettizing
Union Pacific R. R. Co.	N. Topeka, Kans.	1909	2	Burnettizing
U. S. Wood Preserving Plant	Milan, Ill.	1908	1	Creosote (Non-Pressure)
		1910	1	Bethell
U. S. Wood Preserving Plant	So. Stillwater, Minn.	1908	—	Creosote (Open Tank)
U. S. Wood Preserving Plant	Fountain City, Wis.	1908	—	Creosote (Open Tank)
U. S. Wood Preserving Plant	Keokuk, Iowa	1908	—	Creosote (Open Tank)
U. S. Wood Preserving Company	Buell (Near Norfolk)	1906	3	Creosote
Wycoff Pipe & Creosote Co.	Portsmouth, Va.	1881	—	Bethell
W. Pascagoula Creosoting Works	Gautier, Miss.	—	3	Bethell

*Now Building.

CROSS-TIES PURCHASED: 1909.

The total number of wooden cross-ties purchased by the steam and electric railroads of the United States in 1909 was 123,751-000. This represents an increase of 11,285,000 ties, or 10 per cent, over the number purchased in 1908, but a decrease of 29,952,000, or 19.5 per cent, from the number reported for 1907. The year 1907 was one of great activity in the railroad world, while in 1908 the railroads felt the effect of the general business depression and curtailed their expenses accordingly. From a comparison of the figures for 1909, 1908, and 1907, it is evident, however, that the cross-tie industry is rapidly regaining the prosperity enjoyed in 1907.

The figures covering the ties purchased for new track are likewise significant of improvement. Nearly 16,437,000 ties, or 13.3 per cent of the total number, were reported as purchased for new track in 1909, whereas in 1908 only 7,431,000 ties, or 6.6 per cent of the total purchased, were for this use. In 1907 the number was 23,557,000, or 15.3 per cent of the total. Of the ties bought for new track in 1909, the steam railroads reported 13,822,000, or about 84 per cent, and the electric roads 2,615,000. The ties purchased for new track by steam roads formed 12 per cent of all ties purchased by them, while the corresponding proportion for the electric roads was 31.4 per cent. The steam roads, however, showed by far the larger relative gain over 1908 in this respect, since their building activities were restricted during the latter year to a greater extent than was the case with the electric lines.

Table 1 gives the number of ties purchased in 1909, 1908, and 1907, distributed according to class of ties and kind of wood.

Ten kinds of wood supplied 97.3 per cent of all ties purchased. These are oak, southern pine, Douglas fir, western pine, cedar, chestnut, cypress, tamarack, hemlock, and redwood. The oaks led by a wide margin, being the timber used for 57,132,000 ties, or 46.2 per cent of the total number purchased, and more than two and one-half times as many ties were made from the southern pines, which ranked next in importance and which were used in the production of 21,385,000 ties. More than 63 per cent of all ties purchased were made from some species of oak or from the southern yellow pines.

Douglas fir, a species which will probably be drawn upon heavily as the demand for ties crowds the supply, was used for 9,067,000 ties. Ranking next in importance were western pine, cedar and chestnut, each being credited with a total slightly more

Table 1.—Cross-ties purchased, classified according to method by which made and kind of wood: 1909, 1908, and 1907.

1909

KIND OF WOOD.	Total.	Hewed.	Sawed.
Total	123,751,000	95,499,000	28,252,000
Oak	57,132,000	48,009,000	9,123,000
Southern pine	21,385,000	17,452,000	3,933,000
Douglas fir	9,067,000	1,952,000	7,115,000
Western pine	6,797,000	4,466,000	2,331,000
Cedar	6,777,000	4,964,000	1,813,000
Chestnut	6,629,000	5,026,000	1,603,000
Cypress	4,589,000	3,994,000	595,000
Tamarack	3,311,000	2,981,000	330,000
Hemlock	2,642,000	2,215,000	427,000
Redwood	2,088,000	1,770,000	318,000
White pine	556,000	179,000	377,000
Lodgepole pine	487,000	459,000	28,000
Gum	378,000	332,000	46,000
Spruce	225,000	155,000	70,000
Beech	195,000	163,000	32,000
All other	1,493,000	1,382,000	111,000

1908

KIND OF WOOD.	Total.	Hewed.	Sawed.
Total	112,466,000	91,982,000	20,484,000
Oak	48,110,000	42,143,000	5,967,000
Southern pine	21,530,000	18,556,000	2,974,000
Douglas fir	7,988,000	1,946,000	6,042,000
Western pine	3,093,000	2,140,000	953,000
Cedar	8,172,000	7,469,000	703,000
Chestnut	8,074,000	5,400,000	2,674,000
Cypress	3,457,000	3,091,000	366,000
Tamarack	4,025,000	3,806,000	219,000
Hemlock	3,120,000	3,036,000	84,000
Redwood	871,000	757,000	114,000
White pine	707,000	565,000	142,000
Lodgepole pine	518,000	487,000	31,000
Gum	262,000	262,000	....
Spruce	141,000	83,000	58,000
Beech	192,000	191,000	1,000
All other	2,206,000	2,050,000	156,000

1907

KIND OF WOOD.	Total.	Hewed.	Sawed.
Total	153,703,000	118,385,000	35,318,000
Oak	61,757,000	53,702,000	8,055,000
Southern pine	34,215,000	26,227,000	7,988,000
Douglas fir	14,525,000	1,631,000	12,894,000
Western pine	5,019,000	3,255,000	1,764,000
Cedar	8,954,000	8,362,000	592,000
Chestnut	7,851,000	6,330,000	1,521,000
Cypress	6,780,000	5,881,000	899,000
Tamarack	4,562,000	4,152,000	410,000
Hemlock	2,367,000	2,288,000	79,000
Redwood	2,032,000	1,485,000	547,000
White pine	475,000	294,000	181,000
Lodgepole pine	667,000	667,000	....
Gum	15,000	15,000	....
Spruce	104,000	24,000	80,000
Beech	52,000	8,000	44,000
All other	4,328,000	4,064,000	264,000

than 6,500,000 ties. Cypress, tamarack, hemlock and redwood, each supplying more than 2,000,000 ties, complete the list of the ten leading kinds of wood purchased. The remaining species, which include white pine, lodgepole pine, gum, spruce, beech, maple, birch, elm, mesquite, locust, ash, walnut, and a number of others furnished but 3,334,000 ties.

The two leading timbers were the same as in 1908. Oak, with an increase of 9,022,000 ties, contributed a slightly higher proportion of the total number of ties purchased in 1909 than in 1908. Southern pine, on the other hand, furnished a slightly smaller number of ties than in 1908 and a smaller proportion of the total. Douglas fir, with an increase of 1,079,000 ties, held third rank in 1909, the same as in 1907.

Western pine was the only one of the ten leading kinds of wood which showed a marked increase over the figures for 1907, the year for which the heaviest purchases of ties were recorded. Hemlock supplied more ties in 1908 than in 1907, but fewer in 1909 than in 1908. The purchase of 2,088,000 redwood ties in 1909 is the heaviest recorded for this timber, being slightly greater than in 1907 and exceeding that of 1908 by 1,217,000 ties.

The increasing use of several of the relatively unimportant tie woods, especially gum, spruce and beech, is noteworthy. The number of gum ties purchased, which in 1907 was only 15,000, increased to 262,000 in 1908, and by a further gain of 116,000 ties, reached a total of 378,000 ties in 1909. Spruce and beech also showed heavy gains during the past two years. The increasing use of these species which are lacking in decay-resisting qualities is evidence of the growing use of methods of wood preservation through chemical treatment.

Approximately 77 per cent of all ties purchased in 1909 were hewed. Although the proportion of hewed ties was lower than in 1908, it was the same as in 1907 and higher than in 1906. About 82 per cent of all ties purchased in 1908 and about 75 per cent of those purchased in 1906 were hewed. In the industry as a whole it is apparent that methods of manufacture are not undergoing any great general and permanent changes.

Cross-ties made of oak showed a slight gain in the relative number of sawed ties. In 1908, 12.4 per cent of the oak ties purchased were sawed, while in 1909, 16 per cent were so reported. In the case of ties made from southern pine the proportion of hewed ties, although less than in 1908, was greater than in 1907. Douglas fir is the only important timber from which more ties

Table 2.—Cross-ties purchased—Number and cost at point of purchase, by class of railroad purchasing, method by which made, and kind of wood: 1909.

AGGREGATE.

KIND OF WOOD.	Number.	Cost.	KIND OF WOOD.	Number.	Cost.
Total	123,751,000	$60,320,700	Tamarack	3,311,000	$1,356,000
			Hemlock	2,642,000	865,000
Oak	57,132,000	29,062,000	Redwood	2,088,000	1,108,000
Southern pine	21,385,000	11,112,000	White pine	556,000	237,000
Douglas fir	9,067,000	3,754,000	Lodgepole pine	487,000	224,000
Western pine	6,797,000	3,619,000	Gum	378,000	198,000
Cedar	6,777,000	3,085,000	Spruce	225,000	109,000
Chestnut	6,629,000	2,947,000	Beech	195,000	68,700
Cypress	4,589,600	1,902,000	All other	1,493,000	674,000

PURCHASED BY STEAM RAILROADS.

KIND OF WOOD.	TOTAL.		HEWED.		SAWED.	
	Number.	Cost.	Number.	Cost.	Number.	Cost.
Total	115,432,000	$56,139,000	89,884,000	$43,644,000	25,548,000	$12,495,000
Oak	53,843,000	27,292,000	45,565,000	22,885,000	8,278,000	4,407,000
Southern pine	20,138,000	10,353,000	16,932,000	8,534,000	3,206,000	1,819,000
Douglas fir	8,520,000	3,561,000	1,919,000	741,000	6,601,000	2,820,000
Western pine	6,730,000	3,584,000	4,443,000	2,483,000	2,287,000	1,101,000
Cedar	6,078,000	2,793,000	4,332,000	1,984,000	1,746,000	809,000
Chestnut	5,252,000	2,318,000	4,016,000	1,759,000	1,236,000	559,000
Cypress	4,379,000	1,816,000	3,814,000	1,548,000	565,000	268,000
Tamarack	3,205,000	1,314,000	2,926,000	1,201,000	279,000	113,000
Hemlock	2,628,000	861,000	2,201,000	717,000	427,000	144,000
Redwood	1,420,000	785,000	1,128,000	597,000	292,000	188,000
White pine	503,000	211,000	153,000	56,000	350,000	155,000
Lodgepole pine	487,000	224,000	459,000	213,000	28,000	11,000
Gum	378,000	198,000	332,000	182,000	46,000	16,000
Spruce	217,000	105,000	147,000	74,000	70,000	31,000
Beech	193,000	68,000	161,000	57,000	32,000	11,000
All other	1,461,000	656,000	1,356,000	613,000	105,000	43,000

PURCHASED BY ELECTRIC RAILROADS.

KIND OF WOOD.	TOTAL.		HEWED.		SAWED.	
	Number.	Cost.	Number.	Cost.	Number.	Cost.
Total	8,319,000	$4,181,700	5,615,000	$2,746,700	2,704,000	$1,435,000
Oak	3,289,000	1,770,000	2,444,000	1,282,000	845,000	488,000
Southern pine	1,247,000	759,000	520,000	259,000	727,000	500,000
Douglas fir	547,000	193,000	33,000	13,000	514,000	180,000
Western pine	67,000	35,000	23,000	19,000	44,000	16,000
Cedar	699,000	292,000	632,000	266,000	67,000	26,000
Chestnut	1,377,000	629,000	1,010,000	467,000	367,000	162,000
Cypress	210,000	86,000	180,000	72,000	30,000	14,000
Tamarack	106,000	42,000	55,000	19,000	51,000	23,000
Hemlock	14,000	4,000	14,000	4,000	....	....
Redwood	668,000	323,000	642,000	313,000	26,000	10,000
White pine	53,000	26,000	26,000	13,000	27,000	13,000
Lodgepole pine	....	....	....	....	....	....
Gum	....	....	....	....	....	....
Spruce	8,000	4,000	8,000	4,000	....	....
Beech	2,000	700	2,000	700	....	....
All other	32,000	18,000	26,000	15,000	6,000	3,000

are sawed than hewed, 78.5 per cent of the ties reported as made from this timber in 1909 being sawed. The number of ties hewed from Douglas fir does not change from year to year proportionate to the use of the species, the fluctuations in the demand for ties made from this wood being confined largely to sawed ties, which show wide variations annually.

In the case of cedar ties the number of hewed ties shows a steady and heavy decrease since 1907, while the number of sawed ties has increased correspondingly, from 592,000 in 1907, to 1,813,000 in 1909.

Table 2 shows the number and cost of ties purchased by steam and electric railroads of the United States in 1909, classified according to kind of wood and method by which made.

The steam railroads of the United States purchased 115,432,000 cross-ties in 1909, or 93.3 per cent of the total quantity purchased. Of these, 77.9 per cent were hewed and 22.1 per cent sawed. The electric railroads purchased 8,319,000 ties, or 6.7 per cent of the total in 1909, a gain of 1,894,000 ties over 1908. Of these, 67.5 per cent were hewed and 32.5 per cent sawed.

Next to oak ties the electric roads purchased more ties made of chestnut than of any other species. Almost as many southern pine ties were reported by them; and ties of cedar, redwood, and Douglas fir ranked next in importance. Since the steam roads purchased a very high proportion of the total number of ties reported, the rank of the woods used by them is the same as that discussed under the total number purchased by both classes of roads. The less durable woods are little used by the electric roads, doubtless because these roads lack the facilities for preservative treatment which a number of the large steam railroads now possess.

The total cost of all cross-ties purchased in 1909 was $60,320,700, an amount which exceeds the figures for 1908 by more than $4,000,000.

Table 3 shows the average cost of cross-ties purchased by steam and electric railroads in 1909, 1908 and 1907, classified according to method by which made and kind of wood.

In 1909 the average cost per tie was 49 cents as compared with 50 cents in 1908 and 51 cents in 1907. Nevertheless, the average cost of all ties reported as purchased was higher in 1909 than in 1906, when it was 47 cents. A comparison of the figures for 1909, 1908, and 1907, shows that in the case of each of the leading kinds of tie timbers, except western pine, the average price was less in 1909 than in 1907, though the prices paid for chestnut, tamarack, and hemlock were greater in 1908 than in 1907. Western pine ties showed an average cost of 53 cents in 1909 as

Table 3.—Average cost of cross-ties purchased, by class of railroad purchasing, method by which made, and kind of wood: 1909, 1908 and 1907.

PURCHASED BY STEAM AND ELECTRIC RAILROADS.

KIND OF WOOD.	TOTAL.			HEWED.			SAWED.		
	1909	1908	1907	1909	1908	1907	1909	1908	1907
Total	$0.49	$0.50	$0.51	$0.49	$0.50	$0.51	$0.49	$0.52	$0.54
Oak	0.51	0.51	0.53	0.50	0.51	0.53	0.54	0.56	0.59
Southern pine	0.52	0.54	0.54	0.50	0.53	0.51	0.59	0.60	0.62
Douglas fir	0.41	0.45	0.47	0.39	0.41	0.42	0.42	0.46	0.48
Western pine	0.53	0.51	0.50	0.56	0.48	0.49	0.48	0.57	0.52
Cedar	0.46	0.49	0.50	0.45	0.50	0.50	0.46	0.45	0.49
Chestnut	0.44	0.49	0.48	0.44	0.48	0.48	0.45	0.51	0.48
Cypress	0.41	0.44	0.46	0.41	0.43	0.45	0.47	0.52	0.51
Tamarack	0.41	0.50	0.49	0.41	0.51	0.50	0.41	0.41	0.41
Hemlock	0.33	0.38	0.34	0.33	0.38	0.34	0.34	0.36	0.44
Redwood	0.53	0.51	0.59	0.51	0.49	0.60	0.62	0.63	0.57
White pine	0.43	0.47	0.41	0.38	0.47	0.37	0.45	0.51	0.47
Lodgepole pine	0.46	0.48	0.50	0.47	0.48	0.50	0.39	0.41	....
Gum	0.52	0.45	0.23	0.55	0.45	0.23	0.34	....	....
Spruce	0.49	0.47	0.39	0.51	0.52	0.46	0.44	0.40	0.38
Beech	0.36	0.44	0.40	0.36	0.44	0.34	0.36	0.42	0.41
All other	0.45	0.38	0.44	0.45	0.37	0.45	0.41	0.43	0.68
PURCHASED BY STEAM RAILROADS.									
Total	$0.49	$0.50	$0.51	$0.49	$0.50	$0.50	$0.49	$0.52	$0.54
Oak	0.51	0.51	0.53	0.50	0.50	0.52	0.53	0.56	0.58
Southern pine	0.51	0.53	0.53	0.50	0.53	0.51	0.57	0.57	0.62
Douglas fir	0.42	0.45	0.47	0.39	0.41	0.41	0.43	0.47	0.48
Western pine	0.53	0.51	0.50	0.56	0.48	0.49	0.48	0.58	0.51
Cedar	0.46	0.50	0.50	0.46	0.50	0.50	0.46	0.46	0.48
Chestnut	0.44	0.50	0.48	0.44	0.49	0.47	0.45	0.52	0.48
Cypress	0.41	0.44	0.46	0.41	0.43	0.45	0.47	0.52	0.51
Tamarack	0.41	0.50	0.50	0.41	0.51	0.50	0.40	0.41	0.40
Hemlock	0.33	0.38	0.34	0.33	0.38	0.34	0.34	0.36	0.44
Redwood	0.55	0.50	0.57	0.53	0.48	0.57	0.64	0.63	0.55
White pine	0.42	0.47	0.38	0.37	0.46	0.37	0.44	0.51	0.40
Lodgepole pine	0.46	0.48	0.50	0.46	0.48	0.50	0.39	0.41	....
Gum	0.52	0.45	0.23	0.55	0.45	0.23	0.34	....	....
Spruce	0.48	0.45	0.39	0.51	0.50	0.46	0.44	0.40	0.38
Beech	0.36	0.44	0.40	0.35	0.44	0.34	0.36	0.42	0.41
All other	0.45	0.38	0.46	0.45	0.37	0.45	0.41	0.43	0.70
PURCHASED BY ELECTRIC RAILROADS.									
Total	$0.50	$0.51	$0.56	$0.49	$0.50	$0.56	$0.53	$0.54	$0.58
Oak	0.54	0.53	0.60	0.52	0.52	0.59	0.58	0.56	0.62
Southern pine	0.61	0.63	0.65	0.50	0.54	0.60	0.69	0.73	0.71
Douglas fir	0.35	0.37	0.48	0.39	0.34	0.49	0.35	0.38	0.47
Western pine	0.53	0.40	0.56	0.82	0.47	0.57	0.37	0.37	0.55
Cedar	0.42	0.44	0.48	0.42	0.45	0.47	0.39	0.42	0.50
Chestnut	0.46	0.47	0.49	0.46	0.47	0.50	0.44	0.48	0.49
Cypress	0.41	0.42	0.47	0.40	0.41	0.47	0.48	0.54	0.58
Tamarack	0.39	0.37	0.43	0.34	0.37	0.41	0.45	....	0.43
Hemlock	0.31	0.38	0.42	0.31	0.38	0.42	....	....	....
Redwood	0.48	0.52	0.63	0.49	0.51	0.63	0.39	0.58	0.62
White pine	0.49	0.60	0.64	0.50	0.63	0.50	0.49	0.43	0.65
Lodgepole pine	....	....	....	....	....	....	....	....	....
Gum	....	....	....	....	....	....	....	....	....
Spruce	0.54	0.58	....	0.54	0.58	....	....	....	....
Beech	0.40	....	....	0.40	....	....	....	....	....
All other	0.54	0.49	0.60	0.57	0.51	0.59	0.45	0.45	0.62

compared with 51 cents in 1908 and 50 cents in 1907. Sawed ties of this timber were purchased for less in 1909 than in 1908 or 1907;

but there was a remarkable increase in the cost of the hewed ties, due probably to the inclusion in the reports of large numbers of ties which had been treated with a preservative before purchase.

Hemlock ties fell in price from an average of 38 cents in 1908 to 33 cents in 1909. The average cost of chestnut ties was 4 cents lower in 1909 than in 1907, while that of redwood ties was 6 cents lower.

In 1909, the steam roads and electric roads each paid the same average price for hewed ties. Sawed ties were purchased for the same average price (49 cents) as hewed ties by the steam roads, but the electric roads paid 4 cents more for sawed ties. It is an interesting fact that although the average tie used by the electric roads is smaller than that used by the steam roads, the price paid for it is generally greater. This is due not only to the disadvantages incident to contracts for smaller quantities of material. but also to the fact that the electric roads are more likely to purchase ties at points where the price includes railroad transportation charges.

The highest average price reported by the steam railroads was 64 cents for sawed redwood ties and the lowest 33 cents for hewed hemlock. The electric roads paid as high as 82 cents for hewed western pine ties, these being practically all treated, while the lowest average price paid by them was 31 cents for hewed hemlock.

Preservation.

Many species of timber unfitted for use as ties because they lack decay-resisting qualities or immunity to insect attacks, are made available for the purpose by the use of a preservative treatment. Even in the case of wood that is naturally more or less durable, such treatment is often economical, the added life in service more than paying for the increase in the original cost. Of the 78 species of timber which the different specifications of the steam railroads of the United States permit to be used as cross-ties, over one-half are acceptable for such use only after the application of a preservative. Among the woods most commonly treated are pine, red or black oak, Douglas fir, hemlock, gum, spruce and beech.

The remarkable increase in the use of western pine, gum, spruce, and beech cross-ties, apparent in the reported purchases of ties in 1909, is doubtless due to the use of wood preservatives.

Table 4.—Number of cross-ties purchased already treated or treated after purchase, by class of railroad purchasing: 1909,

CLASS OF RAILROAD PURCHASING.	Total treated.	Treated before purchase.	Treated after purchase.
1909			
All railroads	22,033,000	7,663,000	14,370,000
Steam railroads	21,198,000	7,081,000	14,117,000
Electric railroads	835,000	582,000	253,000
1908			
All railroads	23,776,000	10,973,000	12,803,000
Steam railroads	23,157,000	10,566,000	12,591,000
Electric railroads	619,000	407,000	212,000
1907			
All railroads	19,856,000	8,389,000	11,467,000
Steam railroads	19,192,000	7,975,000	11,217,000
Electric railroads	664,000	414,000	250,000

Table 4 shows the number of cross-ties reported as purchased already treated or as treated after purchase by steam and electric railroads of the United States in 1909, 1908, and 1907.

Of the cross-ties purchased in 1909, 22,033,000 were given a preservative treatment. This number is 1,743,000 less than that reported for the preceding year, but 2,177,000 greater than that for 1907. The proportion which treated ties formed of the entire number purchased was 17.8 per cent in 1909, 21.1 per cent in 1908 and 12.9 per cent in 1907. Of the number treated in 1909, about one-third were treated before purchase and two-thirds after purchase.

The steam railroads treated more ties after purchase in 1909 than in 1908 or 1907, although the total number of treated ties reported by them was 1,959,000 less in 1909 than in 1908. The number purchased by them already treated was 3,485,000 less than in 1908. The electric railroads reported 835,000 treated ties, of which 582,000, or 69.7 per cent, were treated before purchase and 253,000, or 30.3 per cent, after purchase.

There are now more than seventy wood-preserving plants in the United States. A number of the large steam roads possess expensive plants fitted to handle large quantities of timber in a very efficient manner. Nearly all treated cross-ties used by steam railroads are treated in closed cylinders permitting the application of pressure and designed to secure a heavy absorption of the preservative. The principal preservatives used were creosote oil, and, to an almost equal degree, a solution of zinc chloride. Many ties are treated with an emulsion of creosote oil and a solution of zinc chloride, and one road treated large quantities of its ties with a heavy injection of crude petroleum. Other preservatives are also used.

The electric railroads own but a few cylinder-treating plants and are generally obliged to purchase treated ties or to use some less expensive method of treatment, such as dipping the ties in a bath of the preservative. Many different preservatives are used in this manner.

Note.—Above information furnished by Forest Service in cooperation with the Department of Commerce and Labor. Issued Feb. 8, 1911, Forest Products Circular No. 8. **Secretary.**

PRESERVATIVES USED.

1909.

(Authority: Forest Service.)

Fifty-one million five hundred thousand gallons of creosote and 16,250,000 pounds of zinc chloride were used in preserving timber in the United States in 1909. Small quantities of crude oil, corrosive sublimate, coal tar and water gas tar were also used. These figures are based upon reports to the United States Forest Service of forty-six firms operating sixty-four timber treating plants, which represents 93 per cent of the plants in operation during that year. These figures show a smaller consumption than in 1908, when forty-four firms operating sixty-four treating plants reported a use of 56,000,000 gallons of creosote and 19,000,000 pounds of zinc chloride.

Assuming that on an average one gallon of creosote, or one-half pound of zinc chloride, will protect a cubic foot of timber from decay, more than 80,000,000 cubic feet of cross-ties, piling, poles, paving blocks, mine and other timbers were given a treatment that will greatly increase their life and usefulness.

Since timber treating began on a commercial scale in the United States the domestic supply of creosote has never been equal to the needs of the industry. With the development of wood preservation in recent years the insufficiency of the home production of creosote has become more marked. In 1908, 69 per cent of the creosote used by the treating plants was imported, and but 31 per cent was obtained from domestic sources. In 1909, 73 per cent of the creosote used was imported and but 27 per cent obtained in this country. Nearly three-fourths of the imported creosote came from England and Germany; some was obtained from other European countries, and some from Nova Scotia. The domestic creosote was obtained chiefly in New York, Philadelphia and other large cities.

Were all the tar produced which the coal annually coked in the United States is capable of yielding it would distil considerably more than is now used by the wood preservers and obtained from domestic sources. Unfortunately, American operators do not even get the fullest use of the limited quantity of coal tar made in this country, for it does not pay the operators to distil coal tar for creosote alone; so, unless they can find a market for the associated products, it is not separated. Germany has gone far ahead of the United States in the development of coal tar products and her exports of them to this country are steadily increasing.

The zinc chloride used in wood preservation was all obtained from domestic sources, according to the reports, most of it being produced by a few large chemical companies.

Cross ties are particularly liable to decay, since they are used under conditions which are favorable to the growth of the wood-destroying fungi. Consequently, the railroads have always taken a leading part in timber preservation in the United States. Thirteen railroads report the operation of timber treating plants; many also have ties and other materials treated by commercial plants.

Reports from sixty-four treating plants show that 16,805,501 hewed ties and 6,010,000 sawed ties were treated by them during 1909. There were also treated by these plants 9,105,627 board feet of switch ties; 902,793 board feet of bridge ties; 6,550,619 lineal feet of piling; 1,159,357 square yards of paving blocks, 88 per cent of which was yellow pine, the remainder being made up of Douglas fir, red gum, etc.; 1,314,172 lineal feet of poles; 67,384 cross arms; 38,838,393 board feet of bridge timbers, and 16,635,172 board feet of other construction timbers. Approximately 4,000,000 board feet of various other materials, such as flooring, mine timbers, wood conduit, car sills, car flooring, etc., were also treated.

The following four companies operating six plants failed to furnish information for this report, and in considering the figures given, therefore, this fact should be taken into account:

Republic Creosoting Company.
Norfolk Creosoting Company.
Eppinger & Russell Company.
Georgia Creosoting Company.

POLES, CROSS ARMS, BRACKETS, AND INSULATOR PINS PURCHASED: 1909.

(Authority Bureau of Census.)

The statistics concerning poles purchased in the United States in 1909 were obtained by the correspondence method employed in securing those for the preceding year and are exceptionally complete. In addition to the figures for poles purchased, this bulletin contains data collected for the first time concerning cross arms, brackets and insulator pins purchased. Reports on these accessories were obtained from practically every concern which uses poles.

Table 1.—Poles purchased—Number and cost, by kind of wood and by class of purchaser: 1909, 1908 and 1907.

KIND OF WOOD.	1909		1908		1907	
	Number.	Cost at point of purchase.	Number.	Cost at point of purchase.	Number.	Cost at point of purchase.
	ALL COMPANIES.					
Total	3,738,740	$7,073,826	3,249,154	$5,928,824	3,283,268	$8,081,768
Cedar	2,439,825	4,679,928	2,200,139	3,780,973	2,109,477	5,202,617
Chestnut	608,066	1,382,599	516,049	1,227,273	630,282	1,619,785
Oak	236,842	136,961	160,702	95,032	76,450	60,285
Pine	179,586	520,052	116,749	382,710	155,960	459,545
Cypress	77,677	117,496	90,579	148,070	100,368	307,974
Juniper	43,581	79,389	42,367	83,401	38,925	109,226
Tamarack	29,889	18,282	24,123	32,212	13,884	10,247
Douglas fir	24,877	35,266	19,542	80,024	15,919	40,720
Redwood	23,145	49,354	13,061	38,849	31,469	109,478
Osage orange	21,491	8,712	18,109	11,261	5,962	2,862
Spruce	11,423	17,857	8,088	23,136	10,646	28,939
Locust	10,463	9,164	10,224	8,233	4,672	3,722
All other	31,875	18,766	29,422	17,650	89,254	126,368

Table 1 shows the total number and cost of poles purchased, by kind of wood and by class of purchasers, for 1909, 1908 and 1907.

The total number of wooden poles purchased by pole consumers in the United States in 1909 was 3,738,740, which is the largest total ever reported. The gain over the number reported for 1908 was 489,586, or 15.1 per cent; and over that for 1907, 455,472, or 13.9 per cent. For the poles purchased in 1909 the sum of $7,073,826 was paid, which, although greater by $1,145,002 than the expenditure reported in 1908, was less by $1,007,942 than that in 1907, when the average cost of poles was greater than in other years. In 1909 the leading kinds of wood were cedar, chestnut, oak and pine, and poles made of these species formed 92.7 per cent of the total number purchased, and represented 95 per cent of the total cost. As in previous years, cedar and chestnut were most important, supplying, respectively, 65.3 per cent and 16.3 per cent of all poles purchased in 1909.

For cedar poles a steady increase is shown, but the number of chestnut poles purchased in 1909, though greater than the number in 1908, was less than that in 1907.

The growing use of oak is notable. In 1907 only 76,450 oak poles were reported, while the number was 160,702 in 1908 and 236,842 in 1909. Other kinds of wood for which steady gains are shown since 1907 are juniper, tamarack, Douglas fir and osage orange. For cypress, on the other hand, annual decreases were reported. More redwood poles were purchased in 1909 than in 1908, but considerably fewer than in 1907.

The species combined in the table under the head "All other" include hemlock, sassafras, catalpa, mulberry, butternut, ash, elm, cottonwood and a number of other woods which were used locally in very small quantities.

The three classes of consumers are credited with about the same proportions of the total number of poles purchased in 1909 as in 1908. In 1909, as in previous years, by far the most important of these classes was that comprising the telephone and telegraph companies, which purchased 2,916,005 poles, or 78 per cent of the total number reported. The electric railroad and electric light and power companies bought 627,414 poles, or 16.8 per cent of all poles purchased in 1909, and the steam railroad companies, 195,321 poles, or a little more than 5 per cent.

Since 1908 there has been an increase of 13.8 per cent in the number of poles purchased by the telephone and telegraph companies and an increase of 18 per cent in the number purchased by the electric railroad and electric light and power companies, while the largest gain, 25.7 per cent, is shown for the steam railroads. In comparison with 1907, however, only the purchases of the telephone and telegraph companies show an increase. The large gain in the returns for these companies is due partly to the omission in 1907 of data for many companies using only short poles.

Cedar and chestnut poles were bought extensively by each class of consumers. The telephone and telegraph companies used a wide variety of woods, reporting relatively large numbers of oak poles, nearly all the poles made of osage orange, and most of those made of tamarack. Among the poles purchased by the electric railroad and electric light and power companies pine poles exceeded in number those of any other species except cedar and chestnut. These companies bought comparatively few oak poles, the number being smaller than in the preceding year. Pine poles were also very prominent in the purchases of the steam railroad companies, nearly equaling the number of cedar poles bought by them.

The average cost of all poles purchased was $1.89 in 1909, as compared with $1.82 in 1908 and $2.46 in 1907. The somewhat high cost in 1907 is accounted for in part by the lack of complete statistics for that year as to the purchases of short poles, which, of course, have a low average value.

For the telephone and telegraph companies the average cost of poles purchased in 1909 was $1.40 per pole; for steam railroad companies, $2.83; and for the electric railroad and electric light and power companies, $3.89. The variations in these figures indicate in a general way the differences in the size or grade of the average pole suitable for the purposes of the different classes of companies.

A comparison of figures for average cost per pole has little value unless account is taken of the different sizes and species represented in the purchases. In general, the value of poles advances very rapidly, though not proportionally with increasing length. The few instances in which a group of poles of a given length costs less on the average than a group of shorter poles of the same species may usually be explained either by the presence of a larger proportion of treated poles among the shorter lengths, or by the purchase of many of the longer poles under consideration in a locality where woods have a comparatively low value.

Table 2 gives the number, cost and average cost per pole of the poles purchased in 1909, by length and by kind of wood.

Of the total number of poles purchased in 1909, nearly one-third were from 20 to 25 feet in length, and more than one-fourth were from 25 to 30 feet in length. Poles under 30 feet in length constituted nearly three-fourths of all poles purchased, while less than one-fortieth of the total number had a length of 45 feet or over.

Cedar was the leading kind of wood in all lengths of poles purchased. Of the oak poles, more than 92 per cent were under 25 feet in length, and by far the largest part were less than 20 feet in length. Osage orange poles and those of the species classified under the head "All other" were also purchased, principally in the short lengths. Many of the oak and osage orange poles were used by rural telephone lines or by the so-called "farmers' exchanges."

Table 2.—Poles purchased—Number, cost, and average cost, by length and by kind of wood: 1909.

KIND OF WOOD.	ALL LENGTHS.			UNDER 20 FEET.		
	Number.	Cost at point of purchase.	Average cost per pole.	Number.	Cost at point of purchase.	Average cost per pole.
Total	3,738.740	$7,073,826	$1.89	571,742	$322,018	$0.56
Cedar	2,439,825	4,679,928	1.92	306,264	191,279	0.62
Chestnut	608,066	1,382,599	2.27	24,008	11,563	0.48
Oak	236,842	136,961	0.58	138,544	48,230	0.35
Pine	179,586	520,062	2.90	47,288	44,184	0.93
Cypress	77,677	117,496	1.51	7,004	4,403	0.63
Juniper	43,581	79,389	1.82	1,743	1,078	0.62
Tamarack	29,889	18,282	0.61	5,098	1,974	0.39
Douglas fir	24,877	35,266	1.42	3,384	1,939	0.57
Redwood	23,145	49,354	2.13	3,606	3,895	1.08
Osage orange	21,491	8,712	0.41	17,402	6,479	0.37
Spruce	11,423	17,857	1.56	606	641	1.06
Locust	10,463	9,164	0.88	3,471	1,298	0.37
All other	31,875	18,766	0.59	13,324	5,055	0.38

KIND OF WOOD.	20 FEET AND OVER BUT UNDER 25 FEET.			25 FEET AND OVER BUT UNDER 30 FEET.		
	Number.	Cost at point of purchase.	Average cost per pole.	Number.	Cost at point of purchase.	Average cost per pole
Total	1,208,029	$986,959	$0.82	990,179	$1,503,378	$1.52
Cedar	852,265	700,452	0.82	701,316	1,060,865	1.50
Chestnut	125,848	97,655	0.78	187,060	260,245	1.39
Oak	79,877	40,709	0.51	10,897	18,404	1.69
Pine	52,271	74,719	1.43	32,049	104,045	3.25
Cypress	22,132	14,306	0.65	17,975	17,928	1.00
Juniper	12,775	10,601	0.83	14,120	18,519	1.31
Tamarack	16,492	6,458	0.39	5,880	3,163	0.54
Douglas fir	10,366	7,346	0.71	4,321	4,391	1.02
Redwood	12,454	18,311	1.47	4,009	12,346	3.08
Osage orange	3,041	1,593	0.52	871	496	0.57
Spruce	3,740	3,432	0.92	4,623	6,316	1.37
Locust	3,948	3,940	1.00	2,264	2,820	1.25
All other	12,820	7,438	0.58	4,794	3,840	0.80

KIND OF WOOD.	30 FEET AND OVER BUT UNDER 35 FEET.			35 FEET AND OVER BUT UNDER 40 FEET.		
	Number.	Cost at point of purchase.	Average cost per pole.	Number.	Cost at point of purchase.	Average cost per pole.
Total	470,344	$1,424,623	$3.03	300,685	$1,394,668	$4.64
Cedar	281,963	896,375	3.18	178,812	919,230	5.14
Chestnut	127,028	334,928	2.64	93,718	351,236	3.75
Oak	4,579	14,206	3.10	1,679	6,041	3.60
Pine	23,959	117,325	4.90	8,917	56,577	6.34
Cypress	15,975	27,949	1.75	8,420	23,417	2.78
Juniper	7,300	14,537	1.99	4,374	17,399	3.98
Tamarack	1,336	1,812	1.36	469	907	1.93
Douglas fir	3,503	6,269	1.79	2,475	10,594	4.28
Redwood	1,398	4,748	3.40	1,425	8,046	5.65
Osage orange	177	144	0.81	....	....	....
Spruce	1,698	4,063	2.40	252	721	2.86
Locust	767	1,037	1.35	....	....	....
All other	661	1,230	1.86	144	500	3.47

Table 2.—Poles purchased—Number, cost, and average cost, by length and by kind of wood: 1909.—Continued.

KIND OF WOOD.	40 FEET AND OVER BUT UNDER 45 FEET.			45 FEET AND OVER BUT UNDER 50 FEET.		
	Number.	Cost at point of purchase.	Average cost per pole.	Number.	Cost at point of purchase.	Average cost per pole.
Total	115,367	$729,730	$6.33	46,462	$343,167	$7.38
Cedar	70,615	473,782	6.71	26,354	212,372	8.06
Chestnut	29,129	153,554	5.27	13,506	92,706	6.86
Oak	589	3,032	5.15	206	1,351	6.56
Pine	9,006	74,173	8.24	2,758	16,729	6.07
Cypress	2,731	9,178	3.36	2,821	15,685	5.56
Juniper	1,975	9,141	4.63	479	2,537	5.28
Tamarack	273	875	3.21	93	671	7.22
Douglas fir	574	3,396	5.92	165	794	4.81
Redwood	191	1,360	7.12	....	....	....
Osage orange[1]	....	....	....	....	....	....
Spruce	277	1,208	4.36	....	....	....
Locust	7	31	4.43	....	....	....
All other	....	....	....	80	322	4.03

KIND OF WOOD.	50 FEET AND OVER BUT UNDER 55 FEET.			55 FEET AND OVER BUT UNDER 60 FEET.			60 FEET AND OVER.		
	Number.	Cost at point of purchase.	Average cost per pole.	Number.	Cost at point of purchase.	Average cost per pole.	Number.	Cost at point of purchase.	Average cost per pole.
Total	21,529	$199,440	$9.26	8,068	$87,175	$10.81	6,335	$82,668	$13.05
Cedar	13,980	135,111	9.66	5,131	56,437	11.00	3,125	44,025	14.09
Chestnut	4,671	40,889	8.75	1,922	21,390	11.12	1,176	18,433	15.67
Oak	210	1,789	8.52	237	2,816	11.88	24	383	15.96
Pine	1,466	13,357	9.11	502	4,613	9.19	1,370	14,330	10.46
Cypress	398	2,769	6.96	94	620	6.60	127	1,242	9.78
Juniper	712	4,678	6.57	48	358	7.46	55	541	9.84
Tamarack	....	....	....	48	422	8.79	200	2,000	10.00
Douglas fir	....	....	....	70	406	5.80	19	131	6.89
Redwood	62	648	10.45	....	....	....	....	....	....
Osage orange[1]	....	....	....	....	....	....	....	....	....
Spruce	....	....	....	....	....	....	227	1,476	6.50
Locust	6	38	6.33	....	....	....	....	....	....
All other	24	161	6.71	16	113	7.06	12	107	8.92

An increase in average cost since 1908 is shown for each group of poles having a length of 30 feet or over. On the other hand, poles under 20 feet in length cost 56 cents per pole in 1909, as compared with 62 cents in 1908, and poles from 20 to 25 feet in length 82 cents in 1909, as compared with 84 cents in 1908, while for those from 25 to 30 feet in length the average cost was the same in both years.

Of poles having a length of 45 feet or over, Douglas fir poles were purchased for the lowest average cost, while among the shorter lengths the lower-priced woods were tamarack, locust, oak and osage orange. The high average cost of pine poles was due to the fact that large numbers of these were treated poles. Redwood poles had a uniformly high average cost. These were probably mostly sawed, as over 98 per cent of redwood poles were so reported in 1906.

Preservation.

An important factor in determining the value of a pole is its ability to resist decay, especially when in contact with the soil. Although durable woods are generally preferred as pole timbers, there is an increasing tendency to purchase species, especially the pines, which are naturally less durable, and to render them less liable to decay by means of a preservative treatment.

Poles may be treated by applying the preservative with a brush, by dipping them in a tank containing the preserving fluid, by standing them in an open tank and securing an absorption of the preservative by periods of heating and cooling, or by the application of pressure to a closed cylinder containing the poles and the preservative.

There is a wide variation in the efficiency of the various preservatives used and of the methods of their application. The resulting increased service secured varies accordingly from a few years to more than twenty.

For some species and for poles intended for use in regions where they will be particularly liable to decay, as in some of the Southern states, a thorough impregnation of the entire pole with the preservative is often most economical.

By far the greater number of the poles reported as treated were made of those timbers which have a naturally long life and were given a light treatment, adding comparatively few years to the life of the pole. It follows, therefore, that the advance in pole preservation as measured by added length of service has been much less in the United States than would be inferred from the number of treated poles reported.

With regard to the number of poles which were treated by the open-tank process no statistics are available, but this practice is known to be increasing.

Reports to the Forest Service from 62 commercial and private treating plants show that in 1909 about 1,123,000 linear feet of pole timber, equivalent to 44,920 poles 25 feet in length, were creosoted under pressure with from 8 to 20 pounds of oil per cubic foot of timber, and that, in addition, several hundred thousand linear feet were given a treatment with creosote oil and a zinc chloride solution combined. The plants reporting poles treated under pressure were all in the Southern states and the wood used was chiefly southern yellow pine. No reports were received from three southern plants which also treated poles by this method.

Among the preservatives reported by the companies which purchased poles were creosote, coal tar, crude oil, various kinds of carbolineum and other patented preservatives.

Of the poles reported in 1909, 576,631, or 15.4 per cent, received treatment before or after purchase. This represents an increase of about 232,000, or 67.4 per cent, over the number reported as treated in 1908, and an increase of 180,432, or 45.5 per cent, over the corresponding number in 1907. In 1908 treated poles formed 10.6 per cent of the total number of poles reported as purchased, and in 1907, 12.1 per cent.

Each class of consumers reported more treated poles in 1909 than in 1908, the percentage of increase being greatest in the case of electric railroad and electric light and power companies.

Telephone and telegraph companies reported that treated poles constituted 12.5 per cent of their purchases in 1909, as compared with 8.5 per cent in 1908 and 10 per cent in 1907. Although these companies use the greatest number of treated poles of any of the several classes of consumers, the proportion which these poles form of their total purchases is the smallest reported for any class.

Of the poles purchased by electric railroad and electric light and power companies in 1909, 24.2 per cent were reported as treated, while in 1908 and 1907 treated poles formed respectively 14.7 per cent and 12.4 per cent of their purchases. These companies use poles of high average grade and value.

The steam railroad companies reported that 31.1 per cent of all poles purchased by them in 1909 were treated, which was the highest proportion reported by any class of consumers. In 1908 the percentage of treated poles for this class of consumers was 30.9, and in 1907 it was 27.6.

Treated cross arms, brackets and pins are used by some companies, but to what extent is not known. According to reports to the Forest Service from 62 treating plants, 67,000 cross arms were treated by them in 1909 with from 10 to 14 pounds of creosote oil per cubic foot of wood. The majority of cross arms are painted before use.

CROSS ARMS, BRACKETS AND INSULATOR PINS.

Table 4 shows the number, cost, and average cost of cross arms purchased, according to kind of wood and class of purchaser.

Table 4.—Cross arms purchased—Number, cost, and average cost, by kind of wood and by class of purchaser: 1909.

KIND OF WOOD.	ALL COMPANIES.			TELEPHONE AND TELEGRAPH COMPANIES.		
	Number.	Cost	Average cost per cross arm.	Number.	Cost.	Average cost per cross arm.
Total	3,508,695	$1,284,952	$0.37	2,064,451	$790,284	$0.38
Douglas fir	1,720,247	657,915	0.38	1,218,054	480,421	0.39
Pine	1,411,438	515,848	0.37	640,725	250,782	0.39
Oak	118,876	28,046	0.24	61,756	14,124	0.23
Cypress	77,957	26,098	0.33	63,242	20,757	0.33
Spruce	74,463	24,569	0.33	10,703	3,004	0.28
Juniper	27,088	9,371	0.35	25,888	9,123	0.35
Cedar	26,629	7,794	0.29	10,754	3,139	0.29
Chestnut	18,642	6,302	0.34	12,822	3,942	0.31
Locust	10,836	3,033	0.28	6,486	1,675	0.26
All other	22,520	5,976	0.27	14,021	3,317	0.24

KIND OF WOOD.	ELECTRIC RAILROAD AND ELECTRIC LIGHT AND POWER COMPANIES.			STEAM RAILROAD COMPANIES.		
	Number.	Cost.	Average cost per cross arm.	Number.	Cost.	Average cost per cross arm.
Total	1,231,177	$432,244	$0.35	213,067	$62,424	$0.29
Douglas fir	422,198	155,960	0.37	79,995	21,534	0.27
Pine	689,664	238,139	0.35	81,049	26,927	0.33
Oak	26,040	7,565	0.29	31,079	6,357	0.20
Cypress	6,274	1,633	0.26	8,441	3,708	0.44
Spruce	62,325	21,275	0.34	1,435	290	0.20
Juniper	1,200	248	0.21	....	....	....
Cedar	5,710	1,422	0.25	10,165	3,223	0.32
Chestnut	5,820	2,360	0.41	....	....	....
Locust	4,047	1,193	0.29	303	165	0.54
All other	7,899	2,449	0.31	600	210	0.35

The number of cross arms purchased in 1909 by the companies which bought poles was 3,508,695, and their total cost was $1,284,952. Douglas fir and pine constituted the material of 89.3 per cent of the cross arms purchased. Oak, cypress and spruce arms were bought in large quantities and several other kinds of wood were also represented.

Of the cross arms bought by the telephone and telegraph companies, nearly 60 per cent were of Douglas fir, and slightly more than 30 per cent were of pine. Pine supplied 56 per cent of the cross arms purchased by the electric railroad and electric light and power companies, while cross arms made from Douglas fir and spruce formed 34.3 per cent and 5.1 per cent, respectively. In the purchases of the steam railroads the proportions of pine and Douglas fir cross arms were respectively 38 per cent and 37.5 per cent, while oak and cedar cross arms were next in importance.

The average cost per cross arm for all poles purchased in 1909 was 37 cents. Of the three classes of consumers, steam railroads reported the lowest average cost per cross arm—29 cents. The telephone and telegraph companies paid an average of 38 cents, and the electric railroad and electric light and power companies paid an average of 35 cents. The highest average price paid by any class of purchasers for any species was 54 cents for locust arms purchased by the steam railroad companies, and the lowest average price was 20 cents for oak and spruce arms bought by the same companies. The figures for average cost per cross arm of different woods are not directly comparable, since the variation in size was not shown.

Table 5 shows the number, cost, and average cost of the brackets purchased in 1909.

Table 5.—Brackets purchased—Number, cost, and average cost, by kind of wood and by class of purchaser: 1909.

KIND OF WOOD.	ALL COMPANIES.			TELEPHONE AND TELEGRAPH COMPANIES.		
	Number.	Cost.	Average cost per bracket.	Number.	Cost.	Average cost per bracket.
Total	6,167,795	$94,721	$0.015	5,145,453	$72,679	$0.014
Oak	5,873.320	88,515	0.015	4,987,145	69,518	0.014
Locust	112,130	2,087	0.019	52,461	928	0.018
Pine	63,292	1,753	0.028	31,778	890	0.028
Douglas fir	53,100	995	0.019	26.161	552	0.021
All other	65,953	1,371	0.021	47,908	791	0.017

KIND OF WOOD.	ELECTRIC RAILROAD AND ELECTRIC LIGHT AND POWER COMPANIES.			STEAM RAILROAD COMPANIES.		
	Number.	Cost.	Average cost per bracket.	Number.	Cost.	Average cost per bracket.
Total	886,673	$19,866	$0.022	135,669	$2,176	$0.016
Oak	779,430	17,345	0.022	106,745	1,652	0.015
Locust	59,669	1,159	0.019	....	....	....
Pine	25,844	670	0.026	5,670	193	0.034
Douglas fir	4,910	128	0.026	22,029	315	0.014
All other	26,820	564	0.034	1,225	16	0.013

The total number of brackets reported in 1909 was 6,167,795 and the amount paid for them was $94,721. Oak was the principal kind of wood used, furnishing 95.2 per cent of the total number of brackets reported and contributing a high proportion of the total in the case of each class of consumers. Locust and pine brackets ranked next in importance among the purchases of both the telegraph and telephone companies and the electric railroad and electric light and power companies. The steam railroads did not purchase any locust brackets, but reported more Douglas fir brackets than any other kind except oak.

The average cost per 100 brackets for all kinds of brackets purchased was $1.50. The electric railroad and electric light and power companies paid the highest average price reported by the several classes of purchasers, $2.20 per 100 brackets, and the telephone and telegraph companies the lowest price, $1.40 per 100 brackets; while the average cost per 100 brackets for the steam railroad companies was $1.60. Pine brackets were the highest-priced brackets among the total purchases and among the purchases of the telephone and telegraph companies, the average cost in each case being $2.80 per 100 brackets. The lowest average cost per 100 brackets reported for any variety by the telephone and telegraph companies was for oak brackets, $1.40, and the lowest average reported by the electric railroad and electric light and power companies was for locust brackets, $1.90. In the case of the steam railroads the lowest average price paid for any of the varieties shown separately was $1.40 per 100 brackets for brackets made from Douglas fir.

Table 6 shows the number, cost, and average cost of insulator pins purchased in 1909.

Of the 18,463,041 insulator pins reported, 70.8 per cent were locust, 12 per cent oak, and 11.9 per cent elm, these three kinds of wood furnishing nearly 95 per cent of the total number purchased in 1909. Locust was used to a far greater extent than any other kind of wood by each class of companies except the steam railroads, which purchased oak pins to a greater extent than any other kind.

Elm pins were next in importance to those of locust in the reports of the telephone and telegraph companies, but the proportion of elm pins purchased by the electric railroad and electric light and power companies was small, and no elm pins were reported by the steam railroads.

Among the species included under the head "All other" are pine, birch, cedar, Douglas fir, eucalyptus and chestnut.

Table 6.—Insulator pins purchased—Number, cost and average cost, by kind of wood and by class of purchaser: 1909.

KIND OF WOOD.	ALL COMPANIES.			TELEPHONE AND TELEGRAPH COMPANIES.		
	Number.	Cost.	Average cost per pin.	Number.	Cost.	Average cost per pin.
Total	18,463,041	$241,096	$0.013	13,900,077	$161,760	$0.012
Locust	13,062,924	170,864	0.013	9,666,667	111,972	0.012
Oak	2,221,776	32,170	0.014	1,406,965	18,041	0.013
Elm	2,193,038	24,168	0.011	2,161,413	23,668	0.011
Osage orange	551,842	6,788	0.012	424,111	4,816	0.011
All other	433,461	7,106	0.016	240,921	3,263	0.014

KIND OF WOOD.	ELECTRIC RAILROAD AND ELECTRIC LIGHT AND POWER COMPANIES.			STEAM RAILROAD COMPANIES.		
	Number.	Cost.	Average cost per pin.	Number.	Cost.	Average cost per pin.
Total	4,177,087	$73,761	$0.018	385,877	$5,575	$0.014
Locust	3,231,090	56,416	0.017	165,167	2,476	0.015
Oak	614,001	11,314	0.018	200,810	2,815	0.014
Elm	31,625	500	0.016	....	....	....
Osage orange	116,651	1,830	0.016	12,080	142	0.012
All other	184,720	3,701	0.020	7,820	142	0.018

The highest average cost per 100 pins shown for any class of purchasers was reported by the electric railroad and electric light and power companies, amounting to $1.80, and the lowest average cost, $1.20 per 100 pins, was reported by the telephone and telegraph companies. The average price paid by the steam roads was $1.40 per 100 pins. Pins of the species grouped under the head "All other" had the highest average cost, while oak and locust pins were the highest priced of the kinds shown separately.

ATCHISON, TOPEKA & SANTA FE RAILWAY COMPANY.

Report of Inspection of Experimental Track on Beaumont Division, G. C. & S. F. Ry. in Texas, February 11, 1911.

The following persons were present:

Dr. von Schrenk, Supervisor Timber Preservation, Rock Island Lines, St. Louis.

Mr. E. O. Faulkner, Manager Tie and Timber Department, A., T. & S. F. Ry. Co., Los Angeles.

Mr. J. A. Glenn, Superintendent Beaumont Division, G. C. & S. F. Ry. Co., Beaumont.

Mr. G. E. Rex, Manager Treating Plants, A., T. & S. F. Ry. Co., Topeka.

Mr. S. A. McNeeley, Kirby Lumber Co., Houston.

Mr. F. B. Ridgway, Chemist, I. C. & C. Co., Texarkana.

Mr. A. L. Koonce, Roadmaster, Conroe, Texas.

Mr. D. Dougherty, Section Foreman, Cleveland, Texas.

Mr. E. E. Kilmer, Stenographer, Topeka.

Mr. H. Davidson, Stenographer, Beaumont.

Remarks.

Ties listed in the column marked "Decay" are such ties as show signs of decay to some extent. Some of these ties will come out of the track this year, but many of them are still good for one or more years' service.

General condition of ties now in the track may be stated as good. There is very little rail wear, except in the cases of tamarack and hemlock ties. The apparent rail cutting evident on many ties is due to adzing necessary on account of changing the rail. The hemlock and tamarack ties, although marked sound, in many instances show signs of severe checking and shattering.

Ties treated with Bakersfield crude petroleum, some of which have been in service since 1902, show remarkable state of preservation. It is particularly noticeable that none of these ties show even the slightest checks. Borings made into these ties show the interior to be perfectly sound.

Rail wear on the ties treated with zinc chloride followed by subsequent treatment of Bakersfield oil was very marked, while in those ties treated with Bakersfield oil alone the rail wear is practically insignificant.

Record of Life of Ties in Experimental Track on the Beaumont Division of the Gulf, Colorado & Santa Fe Railway in Texas.

Kind of Wood	No. of Ties	Kind of Treatment	Year Inserted	Nov. 1903		June 1904		Nov. 1905		Dec. 1906		Feb. 1908		Nov. 1908		Sept. 1909		Ties Still in Track	
				No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
White Oak	196	Untreated	May, 1902			1	0.5					146	75					49	25
White Oak	100	Burnett, Chicago	May, 1902															100	100
White Oak	101	Wellhouse, Chicago	May, 1902									3	3	2	5			96	95
White Oak	107	Zinc-Creo., Beaumont	May, 1902	45	42	36	75.7	26	100									0	0
White Oak	100	Burnett, A.& L. Somerville	May, 1902									17	17	1	18	82	100	0	0
White Oak	100	Wellhouse, A.& L. Somerville	May, 1902											42	42			58	58
White Oak	100	Allardyce, A.& L. Somerville	May, 1902											1	1	1	2	98	98
White Oak	196	Barschall, A.& L. Somerville	May, 1902					2	1	22	12.2	140	83.7					32	16.3
Red Oak	93	Untreated	March, 1902			5	5.4	77	88.2					5	93.5			6	6.5
Red Oak	86	Burnett, Chicago	March, 1902													3	3.5	83	97
Red Oak	20	Burnett, A.& L. Somerville	March, 1902													20	100	0	0
Red Oak	20	Wellhouse, A.& L. Somerville	March, 1902													20	100	0	0
Red Oak	10	Allardyce, A.& L. Somerville	March, 1902															10	100
Red Oak	19	Barschall, A.& L. Somerville	March, 1902					15	78.9	2	89.5			2	100			0	0
Black Oak	24	Untreated	May, 1902					3	12.5	19	91.7	2	100					0	0
Black Oak	86	Wellhouse, Chicago	May, 1902									12	14	2	16.3			72	84
Black Oak	76	Zinc-Creo., Beaumont	May, 1902	36	47.4	40	100											0	0
Black Oak	34	Burnett, A.& L. Somerville	May, 1902									5	14.7					29	85.3
Black Oak	33	Wellhouse, A.& L. Somerville	May, 1902									2	6	16	54.5			15	45.5
Black Oak	60	Allardyce, A.& L. Somerville	May, 1902															60	100
Black Oak	118	Barschall, A.& L. Somerville	May, 1902					104	88.1	4	91.5	3	94.1	7	100			0	0
Turkey Oak	20	Untreated	April, 1902							18	90					2	100	0	0
Turkey Oak	10	Zinc-Creo., Beaumont	April, 1902					10	100									0	0
Turkey Oak	19	Burnett, A.& L. Somerville	April, 1902													19	100	0	0
Turkey Oak	20	Wellhouse, A.& L. Somerville	April, 1902													18	90	2	10
Turkey Oak	10	Allardyce, A.& L. Somerville	April, 1902															10	100
Turkey Oak	19	Barschall, A.& L. Somerville	April, 1902					18	94.7	1	100							0	0
Spanish Oak	20	Untreated	May, 1902					4	20			16	100					0	0
Spanish Oak	10	Zinc-Creo., Beaumont	May, 1902					8	80									2	20
Spanish Oak	21	Burnett, A.& L. Somerville	May, 1902									5	23.8					16	76.2
Spanish Oak	20	Wellhouse, A.& L. Somerville	May, 1902															20	100
Spanish Oak	10	Allardyce, A.& L. Somerville	May, 1902															10	100
Spanish Oak	20	Barschall, A.& L. Somerville	May, 1902					1	5	8	45	11	100					0	0

Record of Life of Ties in Experimental Track on the Beaumont Division of the Gulf, Colorado & Santa Fe Railway in Texas.

Kind of Wood	No. of Ties	Kind of Treatment	Year Inserted	Nov. 1903		June 1904		Nov. 1905		Dec. 1906		Feb. 1908		Nov. 1908		Sept. 1909		Ties Still in Track	
				No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Willow Oak	20	Untreated	May, 1902					15	75	5	100							0	0
Willow Oak	11	Zinc-Creo., Beaumont	May, 1902					11	100									0	0
Willow Oak	20	Burnett, A.& L. Somerville	May, 1902													20	100	0	0
Willow Oak	20	Wellhouse, A.& L. Somerville	May, 1902											8	40			12	60
Willow Oak	10	Allardyce, A.& L. Somerville	May, 1902															10	100
Willow Oak	20	Barschall, A.& L. Somerville	May, 1902					17	85	3	100							0	0
Beech	100	Untreated	Feb. 1902					97	97	3	100							0	0
Beech	50	Zinc-Creo., Beaumont	Feb. 1902									50	100					0	0
Beech	99	Burnett, A.& L. Chicago	Feb. 1902															99	100
Beech	100	Wellhouse, A.& L. Chicago	Feb. 1902															100	100
Beech	50	Allardyce, A.& L. Somerville	Feb. 1902															50	100
Beech	98	Barschall, A.& L. Somerville	Feb. 1902			2	2	96	100									0	0
Hemlock	101	Untreated	April, 1902			101	100											0	0
Hemlock	49	Zinc-Creo., Beaumont	April, 1902							38	77.6			4	85.7			7	14.3
Hemlock	100	Burnett, Chicago	April, 1902											30	30			70	70
Hemlock	100	Wellhouse, Chicago	April, 1902													4	4	96	96
Hemlock	50	Allardyce, A.& L. Somerville	April, 1902															50	100
Hemlock	100	Barschall, A.& L. Somerville	April, 1902					87	87	7	94			6	100			0	0
Tamarack	49	Untreated	May, 1902					49	100									0	0
Tamarack	51	Zinc-Creo., Beaumont	May, 1902													46	90.2	5	9.8
Tamarack	49	Burnett, Chicago	May, 1902															49	100
Tamarack	100	Wellhouse, Chicago	May, 1902															100	100
Tamarack	50	Allardyce, A.& L. Somerville	May, 1902															50	100
Tamarack	98	Barschall, A.& L. Somerville	May, 1902					78	79.6			11	90.8					9	9.2
Shortleaf Pine	100	Untreated	May, 1902			35	35	20	55	44	99							1	1
Shortleaf Pine	50	Zinc-Creo., Beaumont	May, 1902											43	86			7	14
Shortleaf Pine	100	Burnett, A.& L. Somerville	May, 1902											61	61			39	39
Shortleaf Pine	100	Wellhouse, A.& L. Somerville	May, 1902											79	79			21	21
Shortleaf Pine	50	Allardyce, A.& L. Somerville	May, 1902											21	42	1	44	28	56
Shortleaf Pine	98	Barschall, A.& L. Somerville	May, 1902							74	75.5			23	99			1	1
Redheart Pine	100	Barschall, A.& L. Somerville	May, 1902					25	25	49	74	3	77	23	100			0	0

Record of Life of Ties in Experimental Track on the Beaumont Dixision of the Gulf, Colorado & Santa Fe Railway in Texas.

Kind of Wood	No. of Ties	Kind of Treatment	Year Inserted	Nov. 1903		June 1904		Nov. 1905		Dec. 1906		Feb. 1908		Nov. 1908		Sept. 1909		Ties Still in Track	
				No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Longleaf Pine	93	Untreated	April, 1902					85	91.4					1	92.5			7	7.5
Longleaf Pine	50	Zinc-Creo., Beaumont	April, 1902									19	38	1	40			30	60
Longleaf Pine	100	Burnett, A.& L. Somerville	April, 1902									27	27					73	73
Longleaf Pine	100	Wellhouse, A.& L. Somerville	April, 1902									3	5	52	55			45	45
Longleaf Pine	100	Barschall, A.& L. Somerville	April, 1902									95	95					5	5
Longleaf Pine	50	Allardyce, A.& L. Somerville	April, 1902									7	14					43	86
Longleaf Pine	100	Beaumont Oil, Somerville	April, 1902							70	70							30	30
Longleaf Pine	100	Beaumont Oil-Zinc Chloride.	April, 1902															100	100
Longleaf Pine	100	Spirittine, A.& L.	April, 1902							8	8	72	80					20	20
LoblollyPine	100	Untreated	April, 1902			100	100											0	0
aLoblollyPine	49	Zinc-Creo., Beaumont	April, 1902															49	100
bLoblollyPine	99	Burnett, A.& L. Somerville	April, 1902															99	100
cLoblollyPine	99	Wellhouse, A.& L. Somerville	April, 1902															99	100
dLoblollyPine	49	Allardyce, A.& L. Somerville	April, 1902															49	100
LoblollyPine	99	Barschall, A.& L. Somerville	April, 1902					18	18.2	81	100							0	0
LoblollyPine	42	Beaumont Oil, Somerville	April, 1902					40	95.2									2	4.8
LoblollyPine	80	Beaumont Oil-Zinc Chloride.	April, 1902															80	100
LoblollyPine	100	Spirrittine A.& L. Somerville	April. 1902					80	80	18	98							2	2
Pines	84	Avenarius Carbolineum	April, 1905							1	1.2	76	91.7					7	8.3

Remarks: Longleaf and Loblolly soaked with Beaumont Oil absorbed 3 lbs. per cubic foot.

a—Original quantity, 50, one out for test.
b—Original quantity, 50, one out for test.
c—Original quantity, 100, one out for test.
d—Original quantity, 100, one out for test.
Zinc-Creosoted ties, Beaumont over-steamed.
Chicago Tie Preserving Co.'s Ties treated......Chicago.
Ayer & Lord..................................Somerville.
International Creosote Co..................Beaumont.
Hassellman or Barschall by Ayer & Lord Co., Somerville.

WHAT BECOMES OF 300 MILLION FEET OF HICKORY CUT EACH YEAR?

The office of wood utilization of the Forest Service, United States Department of Agriculture, is co-operating with the National Hickory Association in a comprehensive investigation of the country's hickory problem. The annual cut of more than three hundred million feet, exclusive of fuel, is well known, but it is not so well known what becomes of it, or whether it is all put to the best uses for which it is fitted. It is well understood that the country's hickory supply is limited—it probably does not exceed ten billion feet. This is really the world's supply, because the wood grows only in this country. Thirty-four states contribute, but two-thirds of the supply comes from half a dozen. It is one of the most important woods of this or any other country, and for a number of purposes no satisfactory substitute has been found for it. The need, therefore, of securing all possible information is apparent.

It is a wood so valuable for special uses that it ought not to take the place of common lumber. While it is not believed that a very large quantity is so used, yet there are no statistics showing where all the two hundred million feet cut by ordinary sawmills goes. It ought to go to handle mills, carriage shops, and factories that demand it for special and exacting purposes, but it is not known that it all goes there. In fact, it is known that some—probably not much—makes cross ties, fence posts, bridge plank, and other farm timbers. Such use of this valuable wood should not be encouraged. Dozens of cheap and plentiful woods give better service in such places, and it is the worst kind of economy to let good hickory be so diverted while it is in constant demand for carriages and handles.

The investigation will look into the use of hickory as fuel. It is one of the very best woods for that, but logs fit for buggy rims, ax handles, or sucker rods, should not go to the woodpile. The hickory lumberman should have first choice, and the firewood cutter ought to be satisfied with what is left. It is interesting to note that meat packers in many of the cities, and smaller towns as well, prefer hickory to all other woods for smoking meat, and large quantities are so used. This matter will be included in the investigation, and the demands of packers for smokewood will be considered. Doubtless they can use rough and knotty wood as well as the fine grades, and would not insist on clear, straight-grained hickory for their smokehouses, if inferior grades were available. Hickory knots ought to make as good smoke as hickory ax handle stock.

It has been asserted that the waste of hickory in the woods and at the mills is unnecessarily large, but the assertion has been strongly denied. Perhaps similar conditions do not exist in different regions. A thorough investigation of this phase of the question is under way, and it will be carried out by field work in four typical hickory states—Missouri, Mississippi, Louisiana and North Carolina—and by correspondence in twelve other states.

When all obtainable facts relating to the cutting, manufacturing and marketing of hickory have been collected, together with the uses to which it is put, the information will be made available to the thousands of owners, manufacturers and users of this valuable wood in all parts of the country through the Publicity Bureau of the Forest Service and the National Hickory Association, and it is hoped that the information will assist them in turning every stick to the best possible account.

WHAT FOREST FIRES COST IN 1910.

While an accurate estimate of the total fire damage of the past season will never be made, enough is known to place the damage to standing timber in round figures at from $175,000,000 to $200,000,000.

The timber consumed, or damaged beyond hope of utilization before it becomes a total loss by decay, was roughly equivalent to the entire lumber cut of two years, assuming 40,000,000,000 feet as the average annual cut.

Since not more than one-third as much timber is grown as it takes to meet the yearly demand, it would take six years' growth of all the forests of the country to replace the supply wiped out by this year's fires.

The cost of fighting these fires was not less than $1,500,000, and probably exceeded this sum.

Since the production of every thousand feet of lumber represents $10 in wages, $8,000,000 was lost to industry in wages. This is equally true whether or not an equivalent amount is spent for labor in salvage or in converting other forests into manufactured products; for in the long run, the reduction of the forest stock below the minimum required to meet the current demands means the depression of the lumber industry, curtailment of the cut, and consequently a diminished outlay for labor, with corresponding loss in wages.

Before the severe fires of August were more than a probability, this magazine placed the loss to property from the fires in the United States and Canada at about $100,000,000. Since then the fires of the Northwest have caused losses of probably not less than $25,000,000 in the national forests, and those of the Northwest and the Lake States together have destroyed not less than $50,000,000 worth of timber owned by states and private persons.

Details are most complete for the losses to government timber, and it is probable that state and private owners of timber suffered more nearly three times than twice as heavily as the nation by these fires.

A comparison of the public losses with the private losses for the whole country indicates that the private losses were seven times greater than the public losses, in spite of the fact that privately owned forests are not more than five times greater in extent and are more accessible than those publicly owned.

To replace forests by planting on the 4,000,000 acres burned over would cost not less than $40,000,000. It is likely, however, that over much of the area natural seeding from live trees left standing will furnish the beginnings of new growth.

No attempt has been made by American Forestry to estimate the damage to young growth or to the soil. For much of the burned-over land this damage would increase the estimated losses two or three fold.

AUSTRALIAN RAILWAY TIES FOR AMERICA.

A shipment of 70,000 railway ties of "stringy bark" (Eucalyptus obliqua), sometimes termed Tasmanian oak, left Hobart for the United States at the end of October. Two similar shipments will follow, probably, in March and June of 1911, making a total of 210,000 sleepers of Tasmanian timber for the United States.

Stringy bark is much in demand for railway sleepers, being nearly everlasting. Some forest tramways in use by Tasmanian saw mills were laid with stringy-bark sleepers more than fifty years ago, and they are still perfectly sound, after withstanding an enormous heavy timber traffic daily. The average use of these sleepers resting on gravel ballast and subjected to a rainfall varying between 20 and 60 inches per annum is about fifteen years, but they have been taken up after twenty years of use and found perfectly sound. The wood, being practically non-inflammable, makes a valuable safeguard against conflagrations in tunnels, and is especially suitable for underground railways. Stringy bark is marvelously non-absorbent and resistant of damp, making some of the finest railway sleepers in the world, and is comparatively immune from the ravages of white ants and other land insects.

MANY GOOD QUALITIES FOR RAILWAY AND HARBOR WORK.

The Tasmanian wood being hard, bedplates are not required under the rails of the Vignoles section of rail. The holding for spikes is good and the splitting of a sleeper is a rare occurrence. On the Tasmanian main line (3-foot 6-inch gauge) stringy bark sleepers are used. The alignment of the track is very sinuous, many of the curves being only 330 radius, and yet even on these sharp curves so great is the holding power of the spikes in the sleepers that no bearing plates or re-enforcing braces are used.

Stringy bark is especially suitable for harbor construction, being one of the densest timbers in the world and immune from the attacks of marine insects. It is one of the few kinds which can be obtained in great lengths and contains a resinous substance which resists the Xylophages. There is an essential oil in the wood which prevents it rotting under exposure to moisture, and at the same time acts as a preservative to iron. It stands great exposure to heat and damp, besides possessing the valuable property of repelling the white ant and teredo worm.

The timber is of great value in building breakwaters, docks, etc., as its high specific gravity is such that it is unnecessary to weight the piles to get them into position when in deep water, thus saving a great expense. As an instance of the durability of stringy bark when used for piles, a sample of this wood was recently taken from a Hobart pier. It was certified to by the engineer of the Hobart marine board; after being under the water for thirty to forty years it was still perfectly sound.—Vice-Consul-General Henry D. Baker, Sydney.

PULP-WOOD CONSUMPTION.

(Forest Products No. 1.)

The total consumption of pulp-wood by the 253 mills reporting in 1909 was 4,001,607 cords, an increase of 654,654 cords, or 19.6 per cent over the amount used by the 251 mills reporting in 1908, and of 38,947 cords, or 1 per cent, ov.er the quantity reported in 1907, which year previously held the record.

Table 1.—Pulp-wood consumption—Quantity of wood consumed, by kind, with per cent distribution: 1906 to 1909.

KIND OF WOOD.	1909		1908		1907		1906	
	Quantity (cords).	Per cent distribution.	Quantity (cords).	Per cent distribution.	Quantity (cords).	Per cent distribution.	Quantity (cords).	Per cent distribution.
Total	4,001,607	100.0	3,346,953	100.0	3,962,660	100.0	3,661,176	100.0
Spruce:								
Domestic	1,653,249	41.3	1,487,356	44.4	1,795,278	45.3	1,785,680	48.8
Imported	768,332	19.2	672,483	20.1	905,575	22.8	721,322	19.7
Hemlock	559,657	14.0	509,173	17.0	576,154	14.5	528,381	14.4
Poplar:								
Domestic	302,876	7.6	279,564	8.4	352,142	8.9	310,920	8.5
Imported	25,622	0.6	22,653	0.7	19,798	0.5	17,550	0.5
Balsam	95,366	2.4	45,309	1.4	43,884	1.1	33,886	0.9
Pine	90,885	2.3	84,189	2.5	78,583	2.0	69,277	1.9
White fir	37,176	0.9	(1)	....	(1)	....	(1)	....
Cottonwood	36,898	0.9	45,679	1.4	(1)	....	(1)	....
Beech	31,390	0.8	(1)	....	(1)	....	(1)	....
All other species	151,179	3.8	140,547	4.2	191,246	4.8	194,160	5.3
Slab wood and other mill waste	248,977	6.2	(2)	....	(2)	....	(2)	....

[1] Included under "All other species."

[2] Included with other wood, by species.

Consumption, By Kind of Wood .

Table 1 gives the quantity of wood used for pulp in the past four years, by kind. In these figures the results of the temporary business depression prevailing in 1908 are apparent.

There has been a notable decrease in the proportion use of the higher-priced woods, such as spruce and poplar. In 1909, 1,653,249 cords of domestic spruce, together with 768,332 cords of imported spruce, were used, making a total of 2,421,581 cords of spruce, or 60.5 per cent of the total pulp wood consumed. Although this quantity represents an actual increase of 261.742 cords over the quantity of spruce used in 1908, the proportion of the total which it formed was 4 per cent less. The decrease in the proportion is more clearly marked when a comparison is made with the figures for spruce in 1907, a year in which conditions were much more normal than in 1908. The quantity, as well as the proportion, of spruce used in 1907 was larger than in 1909. Poplar formed 8.2 per cent of the total in 1909, as compared with 9.1 per cent in 1908 and 9.4 per cent in 1907.

The figures for hemlock presented in this table show little change during the past four years. The quantity shown for 1908, however, included 105,680 cords of slab wood and other mill waste, which item in 1909 was not distributed by species. On this account the quantity and proportion appear larger for 1908 than for 1909, whereas if the slab wood and other mill waste were deducted they would be smaller than in 1907 or 1909.

In connection with the decreasing use of spruce should be noticed the increasing use of balsam, pine, and white fir. In former years it was the practice in some of the logging operations in the New England states to allow a certain percentage of balsam with the spruce without requiring any mention of it. At present, however, the tendency is to separate the two woods more closely, which may account in part for the increased quantity of balsam reported and its change in rank from last to fourth place. The use of pine has increased slightly from year to year as measured by actual quantity consumed, but its proportion of the total was about the same in each of the four years shown in the table. Particularly interesting is the use of white fir (Abies con-color), which was reported separately for the first time in 1909. The quantity of this wood used was relatively small, probably because its value as a pulp wood is not generally known. It can be reduced readily by the sulphite process. It has a fiber about one-half longer than that of the western spruce, and its cooking conditions are, on the whole, not appreciably different from those for spruce. While no definite figures for the quantity of white fir in the United States have been obtained, it is known that there is a large quantity in northern California, southern Oregon, and other Western states. In some forests in California it is said that this wood forms from 30 to 45 per cent of the stand. Previously there have been few uses for white fir, and the demand has been slight. Its use for pulp will mean much for national forest management, increasing its value in timber sales.

The use of cottonwood has been declining, and the indications are that within a few years this wood will be superseded as a pulp wood. Under the head "All other species" are included chestnut, maple, basswood, gum, birch, Douglas fir, tamarack, cedar, buckeye, willow, and cucumber, arranged in the order of quantity consumed.

As the result of a slight change in the form of the schedule, 248,977 cords of slab wood and other mill waste used for pulp were reported separately in 1909, whereas in previous years this item was included with the regular pulp woods, by species. In 1908 there were approximately 257,000 cords, principally spruce and hemlock. The quantity used in 1909 was over 55,000 cords greater than in 1907.

Consumption, By States.

The number of mills, the quantity of pulp wood consumed, and the quantity of pulp produced are given in Table 2, by states, for 1909, 1908, and 1907.

Although the number of mills changed slightly in several states, the total in 1909 was only two greater than in 1908 and five less than in 1907. The greatest change in the number of mills in the last year occurred in Maine, where there were 35 mills in 1908 and 37 in 1909. The 90 mills in New York used 921,882 cords of pulp wood in 1909, or 23 per cent of the total quantity reported, and 128,961 cords more than in 1908. Maine was the second state in pulp-wood consumption, with 903,962 cords, or 22.6 per cent of the total, which represents an increase of 186,149 cords, or 25.9 per cent, over 1908. The state third in rank was Wisconsin, with 576,019 cords, which was 14.4 per cent of the total, and 20.9 per cent more than in 1908. Wisconsin had the same number of mills as Maine in 1909, 37. New Hampshire was fourth in rank, with 349,997 cords, or 8.7 per cent of the total, and Pennsylvania fifth, with 295,038 cords, or 7.4 per cent. In North Carolina, which ranked sixth, the quantity used, while much greater than in 1908, was less than half that used in Pennsylvania. These six states reported nearly four-fifths of the total quantity consumed in 1909.

Condition of the Wood.

Wood for the manufacture of pulp is received at the mill either rough, peeled, or rossed. Rossing is done by machinery, and peeling usually by hand. A cord of rossed or peeled wood produces more pulp than a cord of rough wood, since the bark, which is of no value for pulp, forms an important part of the volume of the latter. The price per cord was in most cases less for rough wood than for peeled, and highest for rossed wood. The apparent exceptions to this rule to be noted in the table are due to the peculiar local conditions under which certain of the firms that reported were working.

The quantity, cost, and average cost per cord of the wood consumed, according to the condition in which it was received at the mill, are given by states in Table 5.

Table 2.—Pulp-wood consumption—Number of mills, quantity and cost of wood consumed, with average cost per cord, and quantity of pulp produced, by states: 1907 to 1909.

STATE.	Year.	Number of mills.	WOOD CONSUMED.			Pulp produced (tons).
			Quantity (cords).	Cost.	Average cost per cord.	
United States	1909	253	4,001,607	$34,477,540	$8.62	2,491,406
	1908	251	3,346,953	28,047,473	8.38	2,118,947
	1907	258	3,962,660	32,360,276	8.17	2,547,879
Maine	1909	37	903,962	8,267,958	9.15	603,852
	1908	35	717,813	6,326,100	8.81	490,365
	1907	38	942,437	8,010,755	8.50	653,385
Massachusetts	1909	5	45,899	403,778	8.80	26,804
	1908	5	37,079	294,899	7.95	20,626
	1907	5	47,443	402,869	8.49	27,811
Michigan	1909	8	132,846	835,861	6.29	64,369
	1908	9	114,917	758,666	6.60	54,288
	1907	10	125,550	750,097	6.05	64,166
Minnesota	1909	7	47,373	332,548	7.02	37,295
	1908	7	41,795	313,061	7.49	32,572
	1907	6	43,173	338,416	7.84	34,286
New Hampshire	1909	11	349,997	3,276,620	9.36	212,509
	1908	10	284,755	2,732,075	9.59	181,338
	1907	11	429,342	3,429,647	7.99	250,721
New York	1909	90	921,882	9,630,575	10.45	686,323
	1908	90	792,921	7,618,773	9.61	566,658
	1907	92	990,666	9,021,438	9.11	731,278
North Carolina [1]	1909	4	145,090	919,733	6.34	53,926
	1908	5	76,807	461,752	6.01	36,024
Ohio	1909	4	55,275	459,025	8.30	26,977
	1908	4	46,183	360,847	7.81	23,253
	1907	4	59,110	464,895	7.86	31,205
Oregon	1909	5	104,021	797,267	7.66	83,692
	1908	4	83,646	675,419	8.07	64,852
	1907	5	80,614	633,121	7.85	61,366
Pennsylvania	1909	15	295,038	2,139,067	7.25	135,525
	1908	15	272 980	1,884,973	6.91	124,377
	1907	16	318,477	2,196,390	6.90	143,663
Vermont	1909	11	70,977	722,777	10.18	59,356
	1908	12	119,126	772,368	6.48	107,067
	1907	12	89,238	728,895	8.17	74,246
Virginia	1909	6	92,039	772,963	8.40	48,641
	1908	5	61,266	513,788	8.39	35,443
	1907	5	88,491	743,333	8.40	49,970
West Virginia	1909	5	109,166	582,985	5.34	48,797
	1908	5	93,154	504,344	5.41	46,986
	1907	5	96,185	548,528	5.70	47,525
Wisconsin	1909	37	576,019	4,294,229	7.46	324,509
	1908	37	476,619	3,958,721	8.31	268,461
	1907	37	507,295	4,074,625	8.03	299,784
All other states	[2] 1909	8	152,023	1,042,134	6.86	79,741
	[2] 1908	8	127,892	871,688	6.82	66,637
	[3] 1907	12	144,639	1,008,267	6.97	78,473

[1] Statistics for 1907 included in "All other states."

[2] Includes California Delaware, Maryland, South Carolina, Texas, and Washington.

[3] Includes California, Delaware, Illinois, Indiana, Maryland, North Carolina, South Carolina, Texas, and Washington.

Table 5.—Pulp-wood consumption—Quantity and cost of wood consumed, according to condition in which received at the mill, with average cost per cord, by states: 1909.

STATE.	WOOD CONSUMED IN MANUFACTURE OF WOOD PULP.					
	Total.			Rough.		
	Quantity (cords).	Cost.	Average cost per cord.	Quantity (cords).	Cost.	Average cost per cord.
United States	4,001,607	$34,477,540	$8.62	2,219,063	$17,608,736	$7.94
Maine	903,962	8,267,958	9.15	613,197	5,437,072	8.87
Massachusetts	45,899	403,778	8.80	27,584	198,682	7.20
Michigan	132,846	835,861	6.29	97,176	599,447	6.17
Minnesota	47,373	332,548	7.02	47,373	332,548	7.02
New Hampshire	349,997	3,276,620	9.36	90,833	667,605	7.35
New York	921,882	9,630,575	10.45	430,851	3,896,335	9.04
North Carolina	145,090	919,733	6.34	110,625	681,250	6.16
Ohio	55,275	459,025	8.30	25,374	168,183	6.63
Oregon	104,021	797,267	7.66	17,765	95,666	5.39
Pennsylvania	295,038	2,139,067	7.25	61,496	363,363	5.91
Vermont	70,977	722,777	10.18	36,247	338,227	9.33
Virginia	92,039	772,963	8.40	15,594	99,479	6.38
West Virginia	109,166	582,985	5.34	52,556	367,642	7.00
Wisconsin	576,019	4,294,229	7.46	553,496	4,179,690	7.55
All other states[1]	152,023	1,042,134	6.86	38,916	183,547	4.72

STATE.	WOOD CONSUMED IN MANUFACTURE OF WOOD PULP—continued.					
	Peeled.			Rossed.		
	Quantity (cords).	Cost.	Average cost per cord.	Quantity (cords).	Cost.	Average cost per cord.
United States	1,413,997	$12,169,393	$8.61	368,527	$4,699,411	$12.75
Maine	219,698	1,856,333	8.45	71,067	974,553	13.71
Massachusetts	10,679	94,527	8.85	7,636	110,569	14.48
Michigan	34,031	221,232	6.50	1,639	15,182	9.26
Minnesota	....	....	....	....	....	....
New Hampshire	259,164	2,609,015	10.07	....	....	....
New York	254,528	2,631,409	10.34	236,503	3,102,831	13.12
North Carolina	34,465	238,483	6.92	....	....	....
Ohio	29,901	290,842	9.73	....	....	....
Oregon	86,256	701,601	8.13	....	....	....
Pennsylvania	230,542	1,739,724	7.55	3,000	36,000	12.00
Vermont	32,187	354,284	11.02	2,593	30,266	11.67
Virginia	30,356	243,474	8.02	46,089	430,010	9.33
West Virginia	56,610	215,343	3.80	....	....	....
Wisconsin	22,523	114,539	5.09	....	....	....
All other states[1]	113,107	858,587	7.59	....	....	....

[1] Includes California, Delaware, Maryland, South Carolina, Texas, and Washington.

Note.—For further details the reader is referred to pamphlet issued by the Department of Commerce and Labor, Bureau of the Census, Forest Products No. 1, entitled "Pulp-Wood Consumption 1909," dated February 6, 1911.

INDEX.

A.

Allardyce, R. L.—Paper:
"What Penetrations Are to be Expected from the Different Amounts of Preservatives Usually Specified"......112, 113

Allerton, David.—Discussion:
On the Covering of Retorts 40, 41
On Difficulties of Plants in the North vs. the South.....52, 55
On Should Sawn and Hewn Ties be Treated Together 58, 60, 61, 62
On Grouping Timber for Treatment 104
On Preliminary Steaming of Ties 105
On "Resolutions" Grouping of Timber 107, 108
Paper—"What Depths of Penetration Are to be Expected With the Different Amounts of Preservative Usually Specified" 110, 111, 112
Discussion on Depths of Penetration With Different Amounts of Preservatives 116, 118, 120, 121
On Asphaltic Crude Oil 175, 176
On Impurities in Zinc-Chloride 182
On Revision of Constitution and By-Laws 186, 187
Vote of Thanks to the Retiring President 193

Angier, F. J.
Incorporation of the Wood Preservers' Association....30, 188
Discussion on: Covering of Retorts 38, 40, 46
On Difficulties of Plants in the North vs. the South..52, 54, 55
On Should Sawn and Hewn Ties be Treated Together 58, 59, 60, 61
On Grouping Timber for Treatment 94, 95, 103, 104
On "Resolutions" Grouping of Timber.................. 108
On Depths of Penetration With Different Amounts of Preservative 117
Paper—"Some Results Obtained in This Country in Prolonging the Life of Railway Cross-Ties by Preservative Treatment as Shown by the Records That Have Been Kept; and a Better Method of Keeping These Records." 122
On Benefits Derived in Attending the Meetings of the Wood Preservers' Association 160
On Revision of the Constitution and By-Laws 186
Election of as Secretary-Treasurer......................... 191

Ammonium Chloride as an Impurity in Zinc Chloride........ 180
Asphaltic Oils as Applied to the Preservation of Railroad Ties 166-176

Australian Railway Ties for America........................... 244

Attendance at Seventh Annual Meeting 19, 20, 21, 22

B.

Baker, J. S.—Discussion:
  On Difficulties of Plants in the North vs. the South...... 54
  On Should Sawn and Hewn Ties be Treated Together.... 62
  On Grouping of Timber for Treatment 102
  On Revision of Constitution and By-Laws.........185, 186, 187
  On Incorporation of Wood Preservers' Association...... 188
  Committee Report "Revision of Constitution and By-Laws" 30

Berry, C. W.—Discussion:
  On Difficulties of Plants in the North vs. the South...... 54
  On Should Sawn and Hewn Ties be Treated Together..60, 62

Bridge Timber Treated in the United States—Table following page 224

Buehler, Walter—Discussion:
  On Piling Lumber 77, 79, 81, 82
  On Seasoning Paving Material 81
  On Grouping Timber for Treatment 82, 100, 104
  On "Resolutions" Grouping of Timber 108
  On Depths of Penetration of Different Amounts of Preservative 118, 119, 120
  On Life of Cross-Ties 135
  Paper—"Review of Development in the Timber Treating Industry" 147-156
  Discussion on: Asphaltic Crude Oil 179, 180
  On Revision of Constitution and By-Laws 184, 185, 187
  On Incorporation of the Wood Preservers' Association... 188
  Address as Retiring President 192, 193

Burkhalter, D.—Discussion:
  On Difficulties of Plants in the North vs. the South...... 54
  On "Resolutions" Grouping of Timber 107, 108, 109
  On Depths of Penetration With Different Amounts of Preservatives 116, 118
  On Life of Cross-Ties 134
  On Crude Oil 176
  Election of, as Third Vice-President 192

By-Laws and Constitution 7, 8, 9, 10

By-Laws, Revision of 183

C.

Calder, R. J.—
  Letter Regarding the Burning of Beaumont Plant........ 26
  Paper—"How Can Excessive Insurance Rates Usually Charged by Insurance Companies be Avoided"....... ....47, 48, 49, 50
  Election of, as Second Vice-President 192

Card, J. B.—Discussion:
  On the Covering of Retorts............................38, 41
  On Should Sawn and Hewn Ties be Treated Together.... 60
  On Piling Ties 79
  On grouping Timber for Treatment 103
  On Depth of Penetration With Different Amounts of Preservative 118, 120
  On Asphaltic Crude Oil 176

Chanute, Octave—
  Resolutions in Memory of 42
  Photograph of 43

Chanute, C. D.—Discussion:
  On Appointing of Advertising Committee 30
  On Life of Cross-Ties 134, 136
  On Revision of Constitution and By-Laws 183, 186, 187
  Paper—"What Per Cent of Creosote Oil Can be Withdrawn From Wood by Subsequent Vacuum" 163

Cherrington, F. W.—Paper:
  "Asphaltic Oils as Applied to the Preservation of Railroad Ties" 166-176
  Discussion on Asphaltic Oil 176, 178, 179, 180, 181

Church, S. R.—Discussion:
  On the Covering of Retorts 42
  On Depth of Penetration With Different Amounts of Preservative 121
  On Asphaltic Crude Oil 180

Cline, McGarvey—Paper:
  "The Forest Products Laboratory" 198

Constitution and By-Laws 7, 8, 9, 10

Constitution and By-Laws, Revision of 30, 183

Cottonseed Hulls for Covering Retorts 36

Creosote:
  Amount Withdrawn by Subsequent Vacuum 163
  For Paving Blocks 65, 66, 67
  Penetration Deeper than Visible Coloring of the Wood.. 120
  Used in the United States in the Year 1909..........223, 224
  Material Treated With in 1909—Table following page..... 224
Cross Arms—Number Treated in the United States in Year 1909—Table following pages 224, 225
Crude Oil 166
Cubical Measurement of Timber 59, 60

D.

Davidson, G. M.—Discussion:
  On Life of Treated Cross-Ties 139
Dating Nails 136, 137, 138, 139
Douglas Fir, Seasoning of 80
Dry-Kilns 102, 103

E.

Election of Officers 189
England, Grouping of Timber in 101
Entertainment Committee 30
Europe, Wood Block Paving in 64-70

F.

Fisher, Wm. A.—Paper:
  "Some Results From Treated Ties Along the South Atlantic Coast" 131
Forest Products Laboratory, Opening of 25
  What it Is 198
Forest Service, Work Being Done by 27
  Statistics, Collection of 70, 71
Forestry by the Railroads 140
Forest Fires, What They Cost in 1910 ....242, 243

G.

Gibson, Andrew—Discussion:
  On the Covering of Retorts 40
  On Record of Treated Cross-Ties 138
  Paper—"Difficulties Encountered by Plants in the North, that Plants Located in the South do not Have to Contend With" 51, 52
  Discussion on "Plants in the North vs. the South"........ 55
  Election of, as First Vice-President 192

Goltra, W. F.—Discussion:
  On Should Sawn and Hewn Ties be Treated Together..57, 63
  On the Grouping of Timber 83, 97, 98, 99, 100
  On Dry-Kilning of Lumber 103
  On Preliminary Steaming of Ties 104, 105
  On "Resolutions" Grouping of Timber 107
  Paper—"Feasibility of Grouping Timbers for Treatment" 83-94

Grouping Timber for Treatment 83-94

H.

Hageboeck, A. E.—Discussion:
  On Seasoning Douglas Fir 80

Heartwood and Sapwood, Grouping of for Treatment.......... 93

Hickory, What Becomes of 300 Million Feet Cut Each Year.. 240

I.

Insulator Pins Purchased in the United States 225
Insulator Pins Treated in the United States 231
Incorporation of the Wood Preservers' Association..11, 12, 13, 188
Insurance Rates 47, 48, 49, 50

K.

Kiln-Drying Timber 102, 103

L.

Laboratory, Forest Products, Opening 25

Laboratory, Forest Products, What it Is 198

Lagging for Retorts 33, 34, 35, 36

Larkin, A. E.—Discussion:
  On the Covering of Retorts 39
  On Difficulties of Plants in the North vs. the South........ 55
  On Piling Lumber 80, 81
  On Depth of Penetration of Different Amounts of Preservatives 118
  On Revision of Constitution and By-Laws 185

Logan, J. T.—
  Portrait of 5
  Discussion on: Insurance rates 50
  On Difficulties of Plants in the North vs. the South...... 54
  On Should Sawn and Hewn Ties be Treated Together..58, 63
  Paper—"General Review of Timber Treating in This Country, With Special Reference to the Causes That Have and Are Retarding Its More Universal Adoption"..144, 145, 146
  Election of, as President 192

Lumber, How to Pile 72-76
  Treated in the United States—Table following page...... 224

M.

Meyer, August—Discussion:
  On Should Sawn and Hewn Ties be Treated Together... 58

Manganese Chloride as an Antiseptic 180

Material Treated in the United States—Table following page.. 224

Meeting Place for January, 1912.............................. 196

Members, List of 15, 16, 17, 18

Members, Photograph of 6

N.

Nails, Dating 136, 137, 138, 139

National Classification Committee 28, 29

Nation Conservation Congress, Meeting at St. Paul........... 26

Newton, H. M.—Discussion:
  On the Covering of Retorts.............................. 41
  On Should Sawn and Hewn Ties Be Treated Together.... 62
  On Depth of Penetration with Different Amounts of Preservative 121

O.

Officers for 1910 and 1911.................................... 14

Officers, Election of.. 189

Oil, Crude..166-176

Okes, Day I.—Discussion:
  On the Covering of Retorts.............................. 39

P.

Parminter, L. J.—Discussion:
  On the Life of Cross-Ties..............................133, 134

Paving Blocks, Absorption and Expansion of..............81, 82
  Creosote for 65, 66, 67
  Treatment of 100—Table following page.................. 224
  Paper by Dr. von Schrenk.................................64-70

Paving Stock, Piling of......................................80, 81

Penetration, Depth of with Different Amounts of Preservatives 110, 120

Piling Treated in the United States—Table following page.... 224

Piling, Cribbing of 74

Pine, Loblolly, Treatment of 95, 97

Plants, Difficulties in the North vs. the South....51, 52
    List of in the United States....212, 213

Poles, Treatment of (Table following page 224)....176, 230

Poles, Purchased in United States 225

Pooler, F. S.—Discussion:
    On Life of Treated Cross-Ties.... 135
    On Marking Treated Cross-Ties.... 136

Preservative Used in 1909....223, 224

President, Address of 192, 193

Pressure, Method of Applying in Treating Timber.... 119

Program 31, 32

Pulpwood Consumption in the United States....246-250

Program Committee 14

R.

Railroads, What They are doing in Forestry.... 140

Record of Ties in Track.... 127

Retorts, Covering of (Paper by R. W. Yarbrough)....33-36

Resolutions in Memory of Octave Chanute and Samuel L. Rowe 42

Grouping of Timber 107

Rex, George E.—Discussion:
    On the Covering of Retorts....39, 46
    On Should Sawn and Hewn Ties Be Treated Together.... 57
    On Piling Lumber 78, 79
    On Life of Cross-Ties 134, 135
    On Cross-Ties, Marking of.... 137
    On Asphaltic Crude Oil....175, 180

Rollins, H. M.—Discussion:
    On Should Sawn and Hewn Ties Be Treated together...61, 62
    On Piling Lumber 77
    On Depth of Penetration with Different Amounts of Preservative 116, 119
    On Treated Ties Along the South Atlantic Coast.... 132

Rowe, Samuel L.—
    Resolutions in Memory of 42
    Photograph of 44
    Grouping of Timber 80

S.

Sapwood and Heartwood, Grouping of for Treatment.......... 93

Sackett, H. S.—
  Work Done by the Forest Service........................ 27

Seasoning Timber for Treatment 83-94

Secretary-Treasurer, Report of 24

Shipley, Grant B.—Discussion:
  On the Covering of Retorts.............................. 46, 47
  On Revision of the Constitution and By-Laws............ 186

Specific Gravity of Spring and Summer Wood................ 96

Steaming vs. Air Seasoning 104, 105

Sessions.—
  Opening 23
  Tuesday Afternoon 33
  Wednesday Morning 72
  Wednesday Afternoon 107
  Thursday Morning 163
  Thursday Afternoon 185

Sterling, E. A.—Discussion:
  On the Covering of Retorts 42
  On Difficulties of Plants in the North vs. the South........ 53
  On Should Sawn and Hewn Ties Be Treated Together..61, 62
  On Piling Lumber 80
  On Grouping Timber for Treatment....................95, 101
  On Dry-Kilning of Lumber...........................102, 103
  On Depth of Pentration with Different Amounts of Preservative 119
  On Record of Treated and Untreated Ties 138
  On Asphaltic Crude Oil..............................177, 178
  Talk: "Timber Supply in Relation to Wood Preservation" 140, 141, 142, 143

Switch Ties Treated in the United States—Table following page 224

T.

Tamarack, Seasoning of..................................... 81

Tanks, Insulating of............................39, 40, 41, 42, 46

Taylor, C. M.—Discussion:
  On Should Sawn and Hewn Ties Be Treated Together..59, 60, 61
  On Life of Cross-Ties.. 133
  On Asphaltic Crude Oil 180
  On Impurities in Zinc-Chloride........................182, 183
  On Revision of Constitution and By-Laws................ 183
  Talk: "Impurities in Zinc-Chloride" 181, 182

Ties, Sawn and Hewn, Treated Together..............56, 57, 58
  Rate for Handling 54
  Separating in Different Kinds of Wood.................. 82
  Determining Cubical Contents of......................59, 60
  Steaming vs. Air Seasoning...........................104, 105
  Piling of 73-80
  Life of, and Record of 127, 136
  Purchased in 1909 214
  Treated in the United States.............220, 221, 222, 223, 224
  In Texas Test Track, Report of Committee............134, 236
  Treated with Asphaltic Oil............................166-176
  Imported from Australia 244
  Cost of 218

Temperature of Oil in Working Tanks...................... 46

Tiffany, C. W.—Discussion:
  On Asphaltic Crude Oil...............................178, 179

Timber Supply in Relation to Wood Preservation............ 140

Timber, How to Pile 72-76
  Grouping of for Treatment.............................83-94

Texas Experimental Track.............................134, 236

Townsley, William, Jr.—Paper:
  "Benefits Derived from Attending the Annual Meetings of the Wood Preservers' Association by Members of the Association" 157
  Discussion on "Incorporation of Wood Preservers' Association" 188

Treasurer's Report 24

Treatment of Paving Blocks (Table following page 224)....... 82

Trees, Planting of, for Ties 140, 141

V.

Von Schrenk, Hermann.—Discussion:
  On Resolutions in Memory of Octave Chanute and Samuel L. Rowe 45
  Talk: "Wood Block Paving" 64-70

W.

Waterman, J. H.—Discussion:
  On Difficulties of Plants in the North vs. the South.....53, 54
  On Should Sawn and Hewn Ties Be Treated Together.... 61
  Paper: "How to Pile Lumber, or Piling Timber".........72-76
  Discussion on Piling Lumber 78, 79, 82
  On Grouping Timber for Treatment.................. 82
  On "Resolutions" Grouping of Timber.................. 108
  On Life of Cross-Ties 132
  On Dating Nails 137

Water-Gas Tar 69

Weiss, Howard F.—Discussion:
  On Grouping Timber for Treatment...................95, 96
  On Depth of Penetration with Different Amounts of Preservative 119
  On Life of Treated Cross-Ties........................ 139
  On Crude Oil 176, 177

Whitmore, H. J.—Paper:
  "Should Sawn and Hewn Ties of the Same Kind of Timber of the Same Degree of Seasoning Be Treated in the Same Cylinder Load" 56

Williams, J. C.—Discussion (Written):
  On the Covering of Retorts........................... 37
  On Depths of Penetration with Different Amounts of Preservative 114, 115

Wood, Physical Structure in Relation to Penetrability by Preservatives 86

Wood, Filtering Properties of.......................... 121

Wood Block Paving 64-70

Wood Preserving Plants in the United States............212, 213

Wood Preservers' Association, Incorporation of........11, 12, 13

Workman, Franz.—Discussion:
  On Grouping Timber for Treatment.................101, 102
  On Depth of Penetration with Different Amounts of Preservative 120

Y.

Yarbrough, R. W.—Paper:
  "Is the Covering of Retorts Economical and Practical".... 33

Z.

Zinc-Chloride, Penetration in Wood 121
  Committee to Standardize Analyses of 183
  Impurities in 181, 182
  Material Treated with in the United States—Table following page 224
  Used for Treating Timber in the United States for 1909 .... 223, 224

Zinc-Creosote, Material Treated with in the United States—Table following page 224

INDEX TO ADVERTISERS.

Allis-Chalmers Co. xxxvii
American Tie & Timber Co. iv
Angier, F. J. .... ii, xxviii
Atlantic Creosote & Wood Preserving Works. xxix
Ayer & Lord Tie Co. ix
Barber Asphalt Paving Co. xxviii
Baxter & Co., G. S. xxxv
Barrett Manufacturing Co. xiii
Brooks & Co., E. J. iii
Card & McArdle xx
Card, J. B. (Card Process) .... Back Cover
C.-A.-Wood Preserving Co. xxxi
Chanute & Co., O. i
Crane Company viii
Chicago Bridge & Iron Works xxxvi
Engineering Record xxxvi
Eppinger & Russell Co. xiv
Gardner Governor Co. xv
Garlock Packing Co. xxii
General Chemical Co. xviii
Germain Company iii
Goltra Tie Co., W. F. xxi
Graselli Chemical Co. xxvii
Graver Tank Works xxxi
Gulfport Creosoting Co. xxiv
Greenlee Brothers & Co. xxv
Hall & Brown Wood Working Machine Co. xxix
Harrison Safety Boiler Works xxxiii
Henson & Co., Edward F. xxviii
Hobson Electric Co. xxix
Hunt & Co., Robert xxxix
Indian Refining Co. vii
Indiana Zinc-Creosoting Co. xx
International Creosoting & Construction Co. xxx

Joyce-Watkins Co. xii
Kettle River Co., The xi
Kilbourne & Jacobs Co., The xxxviii
Knowles Steam Pump Works v
Lembcke & Co., C. xxiii
Lewis Manufacturing Co., F. J. xi
Lima Locomotive & Machine Co. vi
Lockett & Co., Ltd., A. M. xxxii
Long-Bell Lumber Co., The x
Manitowoc Boiler Works Co. xxxix
National Lumber & Creosoting Co. xxvi
Ohio Ceramic Engineering Co. xvi
Orenstein-Arthur Koppel Co. xxxiv
Pennsylvania Flexible Metallic Tubing Co. xvii
Pittsburgh Forge & Iron Works xxxiii
Pittsburgh Wood Preserving Co. .... ii, xxiv
Porter Company, H. K. xix
Power & Mining Machinery Co. v
Reeves Brothers Company, The iv
Ryerson & Son, Joseph T. xxxv
Republic Creosoting Co. xix
Sandoval Zinc Co. xv
Shipley, Grant B. xv
U. S. Wood Preserving Co. xxiv
Walsh Tie & Timber Co., P. R. ii
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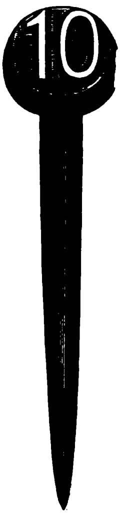

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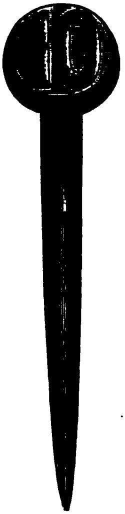

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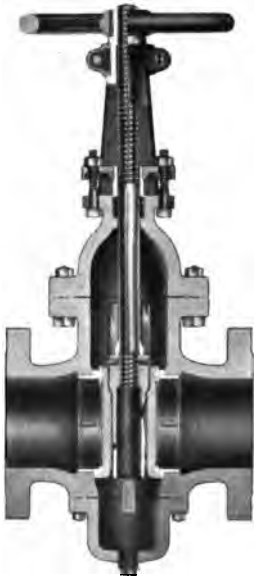

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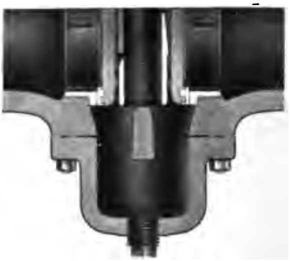

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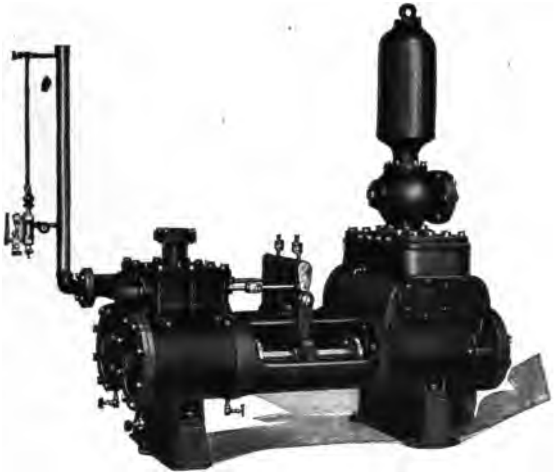

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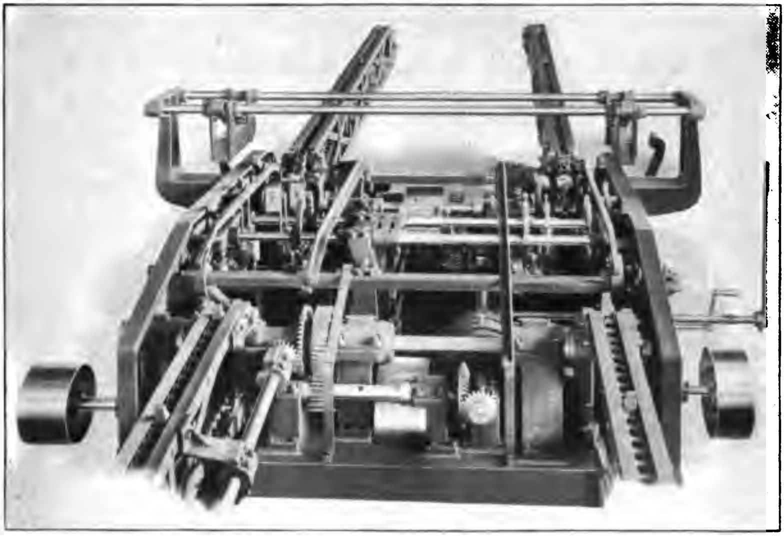

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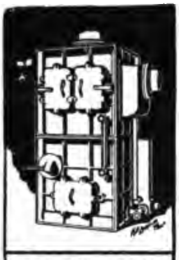

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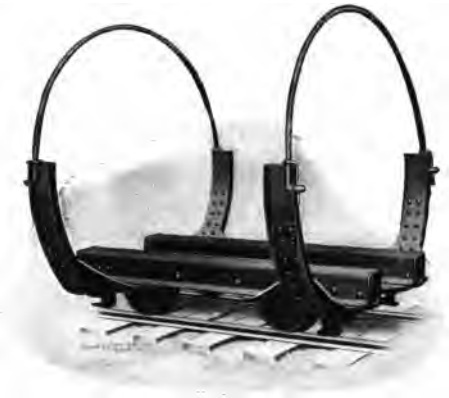

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